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EDITORIAL NOTES.

British Commercial Gas Association.

THE report which the Executive Committee presented last week to the General Committee of the British Commercial Gas Association is a stimulating document, and it gives a large amount of encouragement to those who have had any part in the work of engendering increased interest in, and support for, the organization. Every fresh report and other information incline us more and more to the view that the Association is now an indispensable factor in the commercial and educational machinery of the gas industry; and, as the curtain is occasionally lifted, and a glimpse is obtained of work that the organization is quietly prosecuting without, for politic reasons, making any fuss or publicity over the matter, we are confirmed with increased intensity in the belief that much that is being done could not be undertaken by divided units as it can be, and is being, by a conglomerate body. Those who are non-subscribers to the Association only see the surface of things. Many of them wrongfully regard the organization merely as a centre for advertisements, for the preparation of literature for distribution by gas undertakings, and for the answering of inquiries. It is something much more than this; and, truth to tell, we regard the work that is being done beyond the generally known or ordinary items of the programme as of capital importance in advancing the industry's interests, immediate and future. Our notice of the report of the Executive Committee is far from complete, as it is not deemed wise to lay all the cards on the table. But if the full programme of work could be made public, the Association would, we are convinced, have quite a "boom" in the matter of new subscribers.

As it is, since the General Committee last met, the propaganda work of the Association has obtained for the organization fifty new subscribers. Of these some are only on a partial basis of subscription; but experience shows that the more intimate the subscribers get with the work of the organization, the more willing they are to become full subscribing members. There is a substantial number of undertakings with an output of 50 millions and upwards which are still outside the ranks, and which are not doing anything to help forward a movement the effects of which are, and will continue to be, of the most durable kind. Many local authority gas departments would like to become members; but they have some scruples in the matter, owing to their fear of the attitude of the Local Government Board in surcharging the members of the Councils with any subscription to the Association. Several corporations are already subscribers; and the Irish Local Government Board have consented to a payment of £100 to the Association by the Corporation of Belfast. The greater difficulty is with the Urban District Councils, a number of which are willing to become subscribers if only a favourable decision on the point, which would authorize subscription, can be obtained from the Local Government Board. The Association is moving in the matter; and a letter on the subject has been addressed by the President (Sir Corbet Woodall) to the President of the Board. It is to be hoped the case which the President and the Association are able to lay before the Rt. Hon. John Burns will result in relief being obtained from the present *impasse*, so that all undertakings may be in a position to take financial part in the industry's commercial and educational work. The objects are beneficial ones to both undertakings and the public; and the subscription comes out of the undertakings' funds provided by trading, and therefore not out of the pockets of ratepayers. Thus it is difficult to see that the Board can advance any tangible reason for depriving these concerns of the pleasure and right of supporting the work of the Association.

That the part of the work plainly in evidence is having progressively good results is seen by certain figures in the report now before us. In the ten months ending on Feb. 12 last the Association received no less than 4646 direct inquiries; and only 2000 short of that number were received in the ensuing *two* months. This is remarkably good progress; and it promises to continue—the vigour of the guiding and working forces being anything but on the wane. The Association is also doing a good work in trying to kill the sale of flueless geysers. It is wicked in the extreme that such flueless geysers should be sold for use in confined bath rooms; and we hope that the efforts of the Association to arrest any trade demand for these geysers will result in the withdrawal of such heaters from the market. In what is seen of the useful work of the organization, apart from other important action in regard to which the Association does not make public proclamation, there is surely much inducement for an acceleration of the movement of other gas undertakings into the subscribing lines. Until the Association is the central commercial organization of a completely united gas industry, there will be no cessation of the endeavour to make it so.

The Gas Industry and Illumination.

OBSERVERS of the trend of current events in connection with the industries which supply the agents from which artificial light is obtained, cannot fail to have noticed that the utilization of light in the most scientific fashion, so as to obtain from it the utmost in valuable illumination effect, is a subject that can no longer be ignored. It may be that, for a long time to come, in a great majority of cases, the old way of placing lights with an eye to convenience of situation, rather than to obtaining the maximum of utility, will still have large vogue. It is a vogue that is undergoing a gradual change for the better; but the change has begun at the end where are the largest customers for the lighting agents. This fact alone should stimulate a close study of the science and art of illumination; so should the fact that Governmental and other public authorities have come to the conclusion that, from the national and social points of view, the matter is one that cannot be left any longer to indiscriminate and individual notions as to what is right or what will merely answer, inasmuch as what may be thought right or sufficient may be far from correct. Of course, there is a higher standpoint than that of direct commercial interest in a matter of this kind; and it is that there is a certain responsibility upon those who supply lighting agents to see that they are properly applied, in order that the greatest value may be realized by the user, and that the eyesight of the people may be preserved by rational utilization, and not deteriorated by irrational application. If anyone thinks the matter is merely an abstract or a sentimental one, and will have no effect on the lighting industries in the future, let him read the digest of the report of the Illuminating Engineering Society published in other columns to-day. There is all the evidence there that neglect will eventually meet its due deserts. The Societies which are prosecuting the study of illumination questions have an unanswerable argument to lay before those who are influential in relation to them. They have only to urge a glance at the barbarous examples of lighting that are to be found around us, in streets, workshops, schools, and public institutions (to say nothing of the private ground of domestic habitations, in which education and not compulsion must work improvement), to gain their concurrence with the contention that, when the consequences are considered, there is no defence to incorrect illumination; also with the view that correct application depends upon the qualities in the matters of composition and diffusiveness of the light source.

The work of these Societies is now proceeding in different countries; and gradually they are giving to their work an international significance. The broad promulgation of what is being done must have an educational effect, and must set up a demand (which will be ever expanding) for the scientific application of illuminating agents. The gas industry must

not overlook this new tendency, and must not be in any way behind in what is being done. If it is, the fault for any adverse result will be its own. The importance of the matter was only illustrated the other week when the draft standard specification for street lighting was up for discussion, on the paper prepared by that independent lighting expert, Mr. A. P. Trotter. Had there not been men who could deal with this matter with the interests of the gas industry before them, a specification bearing the endorsement of various technical societies might have been ratified that, in its fundamental part, would have been of an unworkable character in street-lighting contracts, and would not have given gas lighting its full due. The scientific study of the sources of light, too, is bringing out more information regarding the differences in quality, and therefore of relative effects; and the more these matters are explored, the more will it be found that different qualities of illumination suggest different requirements in the matter of treatment. And gas lighting will not be found to be the illuminant that needs the more drastic treatment to make it optically tolerable. It is a somewhat curious fact that, in the technical societies of the gas industry, the evidences are presented of a close study of (say) scientific carbonization and other matters associated with the manufacturing department; and in connection with gas heating, a large amount of technical work has been done. But can anybody point us to any paper read before the professional bodies of the British gas industry that deals with the scientific aspects of illumination (in contrast, if the reader likes, with the scientific aspects of illumination by the chief competitor) apart from those perpetual limitations in the matter of candle power efficiencies per cubic foot of gas consumed? The gas industry, in its technical work, has shown a marked inappreciation of the duty of widening the study of the illumination merits of its prime commodity, and educating the public thereon. The industry has been, as it were, working in *culs de sac* in this matter, and has rarely, if ever, got beyond that one point as to candle-power efficiency. More the pity; for the gas industry has everything to gain by the dissemination of information in other directions. Where the technical bodies of both the gas and electric industries have not hitherto laboured, the Illuminating Engineering Society have entered, and, we willingly agree, have been operating with good effect.

Hygienic and Heating Efficiencies of Gas-Fires.

The last letter on this subject from Mr. H. James Yates ended with the words: "Having thus vindicated my posi- "tion in the fullest possible manner, I am content to leave "this important question to the judgment of the industry at "large." His contentment has been short-lived. Another communication (which we have published as an article in order to give it greater prominence) appears from him this week [p. 724]; and he now shows a violent hurry that was not so perceptible after the statement of Sept. 3 on which comment was first made in the "Journal," and which (notwithstanding anything the author of that statement now says to the contrary) gave rise to the present controversy. Eight months elapsed before Mr. Yates published a reply. So anxious, however, is our friend about the matter now, that he cannot concede his trade opponents sufficient time to have tests made by an independent expert, and the question dealt with from their side in the manner which is due to the gas profession. He commences his letter with an unworthy taunt and false representation. He states that, after a week following his article of May 27, Messrs. Davis wrote a few perfunctory lines, and "*say* that "they have nothing to *say*." The tautology is not ours. The Davis Gas-Stove Company said nothing of the kind, but ended their letter with the words: "We look forward "with much pleasure to dealing with the matter in a com- "plete manner in an early issue."

As a matter of fact, the Davis Company are publishing in our columns this week [p. 721] an article dealing with Mr. Yates's previous communications; and they further inform us, in reply to an inquiry, that arrangements have been made for Mr. W. J. A. Butterfield to carry out tests for them quite independent of the works' staff. The results he will unreservedly place in possession of "Journal" readers. This does not look as though the Davis Company think they have a bad case, or that they have been forced into silence by Mr. Yates, or Professor Bone's ratios, using a Wright fire as a standard, without flue-pipe attached, and therefore, according to Mr. Yates's position, emitting products from under the canopy. The confidence and the attitude of the Davis Company are clearly of a contrary order. In view, however, of the matter resolving itself into the formation of judgment (on the part of gas engineers who are taking an active interest in the question of the relations of hygienic efficiency and heating efficiency) on the respective tests of Professor Bone and Mr. W. J. A. Butterfield, any extended comment on our part on the additional communication by Mr. Yates would only be unnecessarily adding to the amount of material on the subject to which the attention of readers is invited. We will therefore refrain. In fact, if, after perusing Mr. Yates's article, readers will again glance through what we have already written, they will find that what he has now to say does not (though he may affect a belief to the contrary) shake in the slightest degree what we have previously advanced. The remarks that Mr. Yates makes about "bad faith" are puerile in a controversy of this kind. This, too, is essentially a matter where one side has quite as much right as the other to time and to the work, apart from their own staffs, of independent experts of acknowledged position and competence. Professional men of the standing and engagements of Mr. Butterfield cannot be expected to enter upon an investigation of this sort, and present results, at a moment's notice. And we hold that the freedom Mr. Yates claims and takes is the due of others, though he would apparently deny it to them.

Meantime, it may be mentioned that, after the publication of the results of Professor Bone's tests, the Davis Company made a request to be allowed to inspect and to test the two fires with which Professor Bone's tests were carried out. To the best of our belief, the request has not been granted by Mr. Yates, with whom, we presume, solely rests the decision.

Progress in Spiral-Guided Holders.

It is the natural order of things to progress from the diminutive to large size; and the natural order is the way in engineering structural work of all kinds. As we look back to-day, the small spiral-guided holders that were first erected appear from their dimensions to have been merely tentative things; but, at the time of their erection, there were engineers, intelligent and skilled, who looked at them askance, and predicted a very close limit to any departure from the pioneer holders of the type. But what has been seen? Nothing but the normal result of success. Emboldened by success time after time, engineers have, by progressive steps, added to the dimensions of the spiral-guided holders, until now the Oldham Corporation can claim to have the largest one that exists to-day on this system. It has a capacity of 5 million cubic feet; and it has outrun by some distance the capacity that many competent engineers at one time considered would be advisable without the assistance of external guide-framing. And we do not suppose that finality in capacity has by any means been reached by this holder, for which Mr. Tim Duxbury, the Engineer to the Corporation Gas Department, and Messrs. Robert Dempster and Sons, Limited, are jointly responsible. Prior to this, we rather fancy the 4½ million spiral guided holder at Buenos Ayres was the largest of the kind in the world; and probably the one at Newcastle-on-Tyne ranked, speaking from memory, the largest in this country. Those responsible for building larger and still larger holders on the system with which the name of Mr. William Gadd is indelibly associated as the inventor are making history in holder design and construction, just as did Sir George Livesey at East Greenwich, Mr. W. H. Bradley at New York, and Mr. J. G. Newbigging at Manchester, with their large column-guided holders, and just as did (before these mammoth structures) a long string of engineers in their time, place, and degree, as recounted by Sir (then Mr.) George Livesey in his lecture before the old Institution of Gas Engineers in 1902—the last year of its existence. The description of the Oldham holder that appeared last week (and for which we were indebted to Mr. Duxbury) shows that the Corporation have secured a cheap structure, having regard to the time when the contracts were entered into. If they were entering into a contract to-day, we are afraid, looking at current prices for steel and other materials, that there would be some addition to the prices that they have paid. The cost of the holder was £4 9s. per 1000 cubic feet total capacity, or £4 15s. per 1000 cubic feet of working capacity; and the cost of the Portland cement concrete tank was £2 8s. [in error, £4 8s. was mentioned last week in the descriptive

article] per 1000 cubic feet on the total holder capacity. From a wide territory, visitors went to Oldham last Wednesday to be present at the inaugural celebration; and congratulations on the fine piece of work fell freely. All that was said was richly deserved. It is hoped the prosperity of Oldham and of its gas undertaking will give the Chairman (Mr. Alderman H. Wilde) and Gas Committee, the General Manager (Mr. Arthur Andrew), and the Engineer an opportunity before long of again showing their position in progressive gas engineering.

Speakers on the Institution Papers.

ATTENTION is desired to the letter from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) which appears in our "Correspondence" columns to-day, and particularly to the third and fourth paragraphs. The communication deals with the short editorial article in last week's issue, headed "An Institution Mistake"—the mistake, in the opinion of various members of the Institution, as well as in our own judgment, having occurred in the circular sent out asking members to indicate, from the titles, the papers of which they desired copies, and, on the same meagre information, to state upon which paper or papers (if any) the recipient of the circular wished to speak.

The impossibility of forming any safe decision on a title alone is perfectly obvious; but we understand from the letter published to-day that the course indicated by the circular was decided upon by the Council "after the fullest "consideration." That is a matter for regret, as the course decided upon was, we know, condemned by several members, in their individual capacities, and without devoting much time to the consideration of the point. It was expected, it seems, that "members would, from the title of a paper, "be able to say whether they were *likely* to take part in the "discussion." It is a pity that this was not made clear on the circular, though it is easy to foresee that those sending in their names as being "likely" to take part in a discussion might make an unwieldy list, and the necessity, through time-limits, of having to make a selection of speakers from a list of "likely" contributors might have placed the President in a very invidious position at the meeting. The Council surely wanted to obtain something more concrete than a list of possible speakers; and this could only be done *after*, and not before, the members had had an opportunity of reading the papers.

However, the Emergency Committee have met; and it is with the greatest pleasure that we comply with their request to make it known that those members who desire to see the papers before deciding whether or not they can contribute anything useful to one or more of the discussions (members who have nothing useful to say are not expected to wastefully expend the time of the other members) may have advance copies upon application; and, after reading them, they can then send an intimation to the Secretary as to the discussions in which they are prepared to participate. That is more sensible. But as the circular stood, without this modification, it would have been quite possible for a member to have been barred from joining in a discussion on the ground that he had not intimated simultaneously with his application for the paper his wish to take part in the debate, though he had then no knowledge as to the lines the author had taken in the paper. Yet his contribution, inspired by what he had afterwards read, might have been most important. We all heartily desire success for a proper scheme for getting the highest value out of the time devoted to the meetings; and therefore we hope that all members who, after reading the papers, have useful supplementary information to tender, or criticism to make on one or more, will, as early as possible this week, communicate to the Secretary their desire to join in the discussion or discussions.

The Nose and Room Heating.

The name of Dr. Leonard Hill, Professor of Physiology at the London Hospital, has become public property through his campaign on the subjects of atmospheric purity and rational heating in rooms in which humanity lives and assembles. The Doctor has been carrying out some special research into the relative effects of using gas, coal, and anthracite fires and stoves, as well as into high and low temperature water and steam-pipe heating. It is announced in the "Bulletin" of the British Commercial Gas Association that Dr. Hill will be reading a paper on the subject at the National Gas Exhibition in the autumn. Meantime, an article is to be found in the "Lancet" which foreshadows something of the thoroughness with which Dr. Hill has been making this particular investigation. At some time or other, most of us suffer from influenza or "colds in the head," and know how unpleasant is the experience. This is the subject of the "Lancet" article, in the authorship of which Dr. Muecke, the Assistant-Surgeon at the London Throat Hospital, is associated with Dr. Hill. The authors show that the mucous membrane of the nose and throat is very susceptible to changes in atmospheric conditions, which in our rooms should be such that the mucous membrane does not become swollen, and heavily flushed with blood. In such a condition in a warm crowded room, the mucous membrane is covered with a thick secretion, and massively infected with bacteria. The transmission of the bacteria is facilitated in a warm confined atmosphere. Therefore the air should be kept cool and moving. A point of the utmost importance is that Drs. Hill and Muecke find that warm, dry air flushes the mucous membrane with blood, but produces less swelling and secretion than warm moist air does. Further that while convection heat—say, from an anthracite stove—flushes and swells the nasal mucous membrane, radiant heat from a modern gas-fire causes sweating from the skin, and does not affect the nose. The headache and stuffiness felt in rooms heated by steam-pipes, stoves, and hot air are due, the investigators believe, to the swelling of the mucous membrane of the nose and its air sinuses. Change from convected to radiant heat relieves the stuffy feeling, and at the same time causes the skin to become moist, and the nose to return to the normal "out-of-door" appearance.

More Medical Testimony.

The large patronage of gas-fires by medical practitioners, and their advocacy of them, have caused our electrical contemporaries to abate their nonsense about gas-fed fires being unhygienic In lieu of this, they have since made an equally silly attack on the radiant heating efficiency; and this too has been quickly stopped by the assailants as they were labouring under the impression that the heating-efficiency claims of the gas industry were, like their own contentions, merely founded on assumption. In regard to the medical advocacy of the gas-fire, "Public Health" publishes a paper by Dr. W. L. Hawksley, the Assistant Medical Officer of Health and Acting Chief Tuberculosis Officer of the City of Liverpool, on the subject of the diminution of the pollution of the atmosphere. In this paper, the author treats of the sources and effects of smoke, and then comes to the subject of prevention, especially calling attention to the fact that a large proportion of smoke is poured into the atmosphere by domestic chimneys. Dr. Hawksley states that measures designed to encourage the use of gas-cookers and water-heaters will produce useful results, and later dealing with gas-fires says: "During the last few years, great improvements have been effected in connection with gas-fires, and much prejudice against their use has been removed. If properly fixed and used under hygienic conditions, gas-fires are economical and satisfactory. They are specially suitable for bedrooms and rooms occasionally used. The various gas undertakings have done a great deal for smoke prevention; and the extent to which they have assisted in this matter may be estimated when it is mentioned that, in the Metropolis alone, no fewer than 1,300,000 cooking and heating appliances are now served by the gas companies."

Tests of the Mansfield Pipe Locator.—Early last week, Messrs. Edwin A. Mansfield and Co., of New Brighton, carried out at Ormskirk, at the request of the Gas Engineer and Manager (Mr. W. M. Carr), some tests of their pipe locator, a description of which has already appeared in the "JOURNAL;" and they found no less than three mains in one street. On Thursday, they made a test at Crewe, in the presence of the Chief Locomotive Engineer and the Chief of the Staff of the London and North-Western Railway Company, and found everything they sought.

Society of Chemical Industry.—The annual general meeting of the Society will be held in Liverpool from the 16th to the 19th prox., under the presidency of Professor Marston T. Bogert, LL.D. The business will be transacted in the Arts Theatre, in the Victoria Building at the University. The provisional programme which has been issued shows that arrangements have been made for a number of interesting visits; while the social functions will be of an enjoyable character. On the evening of the opening day, there will be a reception by the Lord Mayor.

NOTES FROM WESTMINSTER.

THERE has been a little "flash in the pan" at Westminster, provided by a small opposition to the Tottenham Gas Bill, and some raising of points by gas interests in connection with gas-mains and bridges and level-crossings. The Bournemouth Gas Bill was expected to come on during the week; but consideration has been postponed until this week. It is in the list referred to the Committee who considered the Tottenham Bill; but we should not be at all surprised to learn—some agreements having been effected, and the opposition having in consequence shrunk considerably—that there has been a complete "wiping of the slate," and that the Committee will not be troubled with the measure. We may be mistaken; but at any rate there cannot be much, if anything, of serious account for the Company to encounter. Quite a large number of Bills have been sent forward for third reading, including Local Government Board Provisional Orders Bills. The Electric Wiring and Fittings Bill, with its unusual financial clauses, promoted by the Incorporated Municipal Electrical Association has been re-introduced this session—a process to which it and the House of Commons have become accustomed. Whether the Bill will make any progress is another matter. The House are in the mood for a brief session, after their experience of the last one; and the Premier has promised, by the aid of that legislation accelerating machine, the Parliament Act, to get through all the necessary business of the session by some time in August. In parliamentary matters, however, there are many slips between hope and fulfilment. There are some members of Parliament who would like to see things through so that all the sweltering days of the summer, if we are going to have any more this year, are not spent in the House. The time has often been when the temperature conditions in the Committee rooms have been intolerable, and when learned counsel have been permitted to remove their wigs, and so have the same facility for mopping their foreheads as expert witnesses, the local alderman and councillor, the members of boards of directors who have been present supporting or opposing Bills, and the general hangers-on. It is not altogether clear, however, whether counsel would not this year be glad enough to have the chance of wearing their wigs in a torrid atmosphere, because peaceful negotiatory inclinations have worn down to very thin substance their work at the Parliamentary Bar—especially this session. This is a public economy; but not all who move and labour in Westminster are fascinated and pleased by its effects.

Tottenham Progress. There has been considerable profitable delay in the progress of the Tottenham and Edmonton Gas Company's Bill, which provides among other things for the transfer to the promoters of the Enfield Gas Company's undertaking, the establishment of an electricity supply in the Wood Green district, and many other matters of minor importance. The delay was profitable inasmuch as diplomacy and a desire to deal amicably and reasonably with all opponents resulted in the Bill appearing before Mr. Herbert Craig's Committee with only the Printers' Almshouses Corporation in opposition, on the question of the site for the electricity generating-station. Some 1000 notices were sent out to property owners in connection with the site (which is the property of the Company), and only the Almshouses Corporation were hostile. They believed there would be a disturbance of the placid life of the inmates; but already the almshouses have as neighbours a small engineering works and a tramway depôt, which are not ordinarily peacefully inclined. The Corporation also urged that the promoters were taking away from them the common law right that they now possess against anyone for committing a nuisance, inasmuch as section 81 of the Electric Lighting Clauses Act of 1899 was expressly excluded from applying to the Company. The London Electricity Supply Companies, it may be mentioned, are specifically excluded from the section in question. But the Tottenham Company, through their Chairman (Sir Corbet Woodall), expressed their willingness to insert it; and they left the Committee with their own site, and the obligation to answer for any nuisance, which they will do their utmost to avoid. The nature of the agreements they have made with others will be ascertained when the Act comes forward for notice. At the moment, it does not look as though the measure has anything else to fear that will embarrass its future progress.

Mains over Bridges. Mr. Herbert Craig's Committee were relieved of having to determine a nice point of disagreement between the Gaslight and Coke Company and the London County Council, by throwing out a Bill promoted by the latter for power to construct a new bridge in place of the old existing Lambeth Bridge. The matter is almost sure to come up again in some future session, and possibly by that time the Council will see the Company's rights in a new light. The facts are simple. Half a century ago, the Company entered into an agreement with the then private Lambeth Bridge owners (the predecessors in the matter of the County Council), and paid them a considerable sum for the right to carry their mains over the old bridge. A condition of the agreement was that the Bridge Company should always maintain it in a condition to carry the mains. Now the County Council want to pull down the old bridge and construct a new one; but they did not propose to do anything more than provide the Gas Company with a place for a main. The Company contended, however, that having acquired a perpetual right to support on the old bridge for two mains, the Council should bear the expense of a new main across the new bridge. But the matter was not decided, owing to the rejection of the whole measure. If the Council reintroduce it at some future time, the matter in dispute will have to be reopened.

Mains and Level Crossings. The Peterborough Gas Company and the Great Northern Railway Company have submitted to the adjudication of Sir Luke White's Committee a point in dispute between them. Most people who have been to Peterborough know the Cowgate level crossing. The Railway Company are asking for the right to widen their lines at this point. In doing this, they will be stopping up part of the roadway under which the Gas Company have the right to lay mains. Moreover, along these lines the Railway Company will be sending fast instead of slow traffic, which will mean increased vibration for the 5 and 12 inch gas-mains below the surface. The Gas Company, under these circumstances, considered the Railway Company should construct a culvert for the pipes, and take all other necessary precautions to prevent injury to them. The Railway Company were of the contrary opinion; and the Committee did not see their way to go the length of statutorily compelling the Railway Company to do what the Gas Company asked.

Metropolitan Water. The Bill of the Metropolitan Water Board deals with so many different works in their spacious supply area that they defy explanation in a few lines. But when it is mentioned that borrowing powers are sought to the extent of 1¼ millions sterling, and that a large part will be required for carrying out the new and improving works, it will be seen that, in the aggregate, they have a big importance. When the Bill came before Lord Clinton's Committee, the opposition was found to be of a minor order. There were certain modifications made, but the scheme generally left the Committee in much the same form as it appeared before them.

PERSONAL.

At the meeting of the Halifax Town Council last Wednesday, the salary of Mr. W. B. M'LUSKY, the Gas Engineer and Manager, was increased, on the recommendation of the Gas Committee, by £100 per annum, as from the 1st of April last.

It was mentioned in the last number of the "JOURNAL" that Mr. G. T. EDWARDS, the Chief Assistant Engineer to the Derwent Valley Water Board, had been appointed Water Engineer and Manager to the Corporation of Leicester, in succession to Mr. F. Griffith. This appointment has led to the abrupt resignation of the Assistant Water Engineer, Mr. NEVILLE B. DAVIS, Assoc. M.Inst.C.E., who had been in the service of the Corporation for twenty-two years, and was a candidate for the higher position for which his long experience in the Water Department seemed to have specially qualified him. He was frequently in charge of the works during the absence of Mr. Griffith, and the responsible representatives of the ratepayers have expressed themselves as highly satisfied with his work. Moreover, the staff acted loyally with him, and regarded him as Mr. Griffith's successor; and much astonishment has been manifested that he has not been raised to this position.

OBITUARY.

We regret to learn that Mr. THOMAS THOMAS, who was Manager of the Knutsford Light and Water Company from 1869 to 1910, died last Thursday, at the age of 72. Deceased went to Knutsford from Northwich, and during the forty-one years he was Manager the make of gas increased from something like 5 million to about 34¾ million cubic feet per annum. He was for many years a member of the Manchester District Institution of Gas Engineers, and retired from that body when he ceased, on account of ill-health, to be Manager at Knutsford.

The Carlisle Appointment.—The Carlisle Gas Committee, at a special meeting last Tuesday, considered 41 applications for the position of Gas Engineer and Manager, rendered vacant by the appointment of Mr. Harold E. Bloor to York. Six candidates were selected to appear before the Committee yesterday, and, as the result, Mr. E. George Hutchinson, of Workington, was recommended for the appointment.

Cost of the Oldham Tank: A Correction.—At the close of the description of the new spiral-guided gasholder at Oldham in the last number of the "JOURNAL," it was stated that the cost of the tank complete, excluding the inlet and outlet pipes, was "£4 8s. per 1000 cubic feet on the total capacity of the holder." We learn from Mr. Duxbury that this figure was a clerical error, and that it should be £2 8s.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Papers for the Forthcoming Congress.

In the "Journal" for the 22nd of April, we gave an outline of the arrangements for the forthcoming congress of the Société Technique du Gaz en France, which will open at Toulouse next Tuesday, and extend over the rest of the week. We could not then indicate the nature of the technical business, as the list of papers had not been issued. It is, however, contained in the current number of the "Journal des Usines à Gaz." The following are the titles of the communications, and names of authors:—

"Improved Grids for Gas-Ovens," by M. Jacquesson.

"A New Type of Gas Generator of Large Productive Capacity," by M. Marconnet.

"Furnaces Operated with Heavy Tar Oils," by M. Stein.

"Double-Scoop Charging Machines for Small Works," by M. Bachelay.

"Arrangement for Clearing Ascension-Pipes," by M. Naudé.

"The Constitution of Coal Tars," by M. Ab-der-Halden.

"Decomposition of the Sulphide of Carbon in Illuminating Gas by Hot Purification," by M. Carpenter.

"Conveyance of the Coke-Oven Gas Produced at Roche-la-Molière to the Gas-Works at Firminy," by M. Chanial.

"Appliance for Making Connections of all Diameters on Charged Mains," by M. Hugues.

"Heating Bakers' Ovens by Gas," by M. Rouland.

"A New Use for Coal Gas," "Arrangement for Regulating the Supply of Gas to Upright and Inverted Burners," and "An Incandescent Burner with Inextinguishable Blue-Flame Pilot-Light," by M. Grebel.

"New Appliance for Lighting and Extinguishing Gas at a Distance," by M. Aublant.

"Ice-Making in Gas and Electric Light Works," by M. Blachette.

In addition to the papers, the members will have before them reports from the Committees on Professional Training, Manufacture, Distribution, and the Application of Gas; and, as previously mentioned, informal discussions will be opened on the washing of clinkers and the utilization of combustible residuals, the use of small coke in gas generators and appliances for central heating, and the employment of gas in connection with the food industry. With the view of allowing as much time as possible for the discussions, the authors of the papers are requested, as in the case of the Institution of Gas Engineers, to summarize them instead of reading them in their entirety.

ELECTRICITY SUPPLY MEMORANDA.

The Incorporated Municipal Electrical Association have fixed their annual convention for the 17th to the 21st inst. in London. The 17th to the 20th are the dates between and including which the Institution of Gas Engineers will also be holding their annual meeting in London.

In Camera.

The meetings will be held a little distance apart—the electricals assembling at the home of the Institution of Electrical Engineers, while the nomads of the gas industry will be meeting at the Caxton Hall. The only places, therefore, where the rivals are likely to come into contact are at their hotels; and we hope there will be no shocks or explosions (one industry is the producer of very explosive gas—*e.g.*, Nottingham and Hebburn-on-Tyne) as the result, but that any chance meetings will be of the most fraternal character. The programme issued for the electrical technical meeting is not of massive proportions; and the only two subjects in which we have any really live interest are to be discussed *in camera*. As membership cannot be claimed nor service in the electrical department of a municipal corporation, it will be our ill-fortune not to hear the discussions on the Municipal Wirings and Fittings Bill, and on heating and cooking. It looks rather as though in regard to both subjects the Council of the Association fear that something will be said that should not meet, on the one hand, the eyes of the opponents to the Bill, and, on the other hand, the eyes of the public. The Bill of the Association to give municipal authorities licence in the matter of wiring and fittings, as well as extraordinary money borrowing power, has never been a very promising child. It has now been on and off the shelf in Parliament so frequently, that it presents a somewhat worn appearance. The municipal authorities themselves have given it only a mixed reception, and comparatively little financial support. The electrical contractors are showing their teeth over it; and large ratepayers in districts where there is municipal electricity supply are not anxious to see Parliament endorse any extensions of municipal trading. The House of Lords is deadly in earnest in its opposition to any such extension, as against private enterprise. Money has been spent in the promotion of the Bill; but as it was in the beginning, so it is now, and probably ever will be, unless things change considerably. But that change is not yet. The Bill is generally introduced late in the session; reaches second reading; and then is marked "dropped." That has been its common fate. Though we are in June, with a promise (rash or otherwise) that the session will end in August, the title of the Bill has only just been printed in the session's record of Bills in progress. But there is the other subject that is to receive private treatment—heating and cooking. Why a discussion *in camera?* We know that the comparatively few users of both electric radiators and cookers have found out, or are finding out, their deficiencies, and are circulating their experiences; and we know, too, that some electrical engineers have given up all idea of there being, in the cooking line, any chance for electricity competing with gas, except a remote one in the single line of the oven work, and that only by making a tight oven in which the expensive thermal energy is conserved as much as possible. If the municipal electrical people are not, at their meeting, going to talk about the weak side of the electric cooking business, it is hard to see the reason for secret debate.

Preacher and Practice.

It is comparatively easy to preach; but it is not always so easy to put into practice what one preaches. The "Electrician" has had an article in its columns headed "Didymus." To the doubting Thomas of scriptural fame, the "Electrician" writer apparently likens many of the central station engineers up and down the country, on the ground that they doubt the general efficiency of the electrical service for domestic purposes other than lighting, and consequently do not indulge in propagandist work which he believes would result in catching the public. We rather admire men who have the courage of their convictions to such an extent that they refuse to preach deception. Because, truth to tell, there has been a great deal of pretence and deception permeating the electrical commercial campaign—more than has been good for a healthy reputation among the public. The "Electrician," however, holds that it is the business of the central station engineer to foster the domestic consumer. Agreement with this submission rests entirely upon the area of meaning attached to the word "foster." Furthermore, our contemporary cannot help thinking that, where station engineers are in a position to carry out in their own homes the recommendations they daily make—either directly or through their commercial departments—to the residents in their district, they should feel it is their bounden duty to put all their precepts into regular practice. This is a carefully constructed suggestion, because many station engineers are not in a position to carry out in their own homes the doctrines they are bound, in their official position, to publicly proclaim. It is not always their own fault. Many of them are counted rich by their employers on £200 to £300 a year; and there is not much electrical heating or cooking to be done out of that in their own homes. If they, wearied after the day's electrical exertions and experiences, go to a home in which the cooking and, at any rate some, heating is done by dependable gas and economical appliances, who can blame them? If when they sit down to a joint and other viands cooked in a gas-oven, or upon its top-plate, the convenience being within their reach, who can blame them when they have a hearty laugh at the platform electrical cookery demonstrator, with pale-cased jam tarts and bacon shavings, and ludicrous talk of the wastage of gas-cooked joints and the savings to be effected by the electric cooking of joints? They know that the wastage need not be more with the one system of cooking than with the other, through the regulation of temperatures to obtain the degree of cooking required. They also know that the electric-cooker cannot compete with gas in any of the other operations associated with the preparation of meals. They find no obligation upon them, for the reward received for their services, to alter their home practices, and to submit their home to greater expense and an unreliability which is not now experienced. Who with any intelligence can blame them?

Recognition.

Some electrical engineers and writers are extraordinarily blind, or they profess to be so. They would not see that there was any improvement in a gas appliance of any kind, even if poked under their very noses. It becomes a matter of interest, therefore, when "Electrical Industries" makes acknowledgment that gas appliances not only show improvement, but that the improvement is of a character that impresses. A representative of the paper has been to the National Health Exhibition and to other shows; and, wherever he goes, he finds the gas industry to the fore, and the electrical industry—nowhere. In fact, he thinks the electrical industry has much to learn from the gas industry He has also come to the conclusion that some electricians are apt to lose sight of the fact that "the gas equipments of four years' ago are not the gas equipments of to-day. Substantial structural developments are taking place; and it behoves the electrical industry to be aware of this, and to lose no opportunity that offers for the practical display of its competing wares." Further, he says, "it is not a bit of good to regard the gas industry as doomed, and to sit down and wait for its funeral." There is practical sense in these words; and it is just as well for the electrical industry to be warned by someone from within its own sphere. Those who really know the position of the gas industry in all its bearings, have been struck by the grotesque attitude taken up by some writers and speakers in the electricity supply industry concerning the gas industry and its affairs. The most arrant rubbish has been published by certain of our electrical contemporaries, until we have been led to wonder whether the responsible editors of the publications have been in their right senses in

allowing such nonsense to disgrace their columns. Anyway, it did not testify to any high intelligence. How, for example, any of them should have thought that the gas industry, with all its resources and scientific workers constantly engaged along constructive lines—engineering and chemical, and in producing higher efficiencies in the application of their produce—would stand immovable passes our intelligence. But so it has been; and the sooner a more enlightened attitude takes the place of fatuous and illusive views which are more worthy of inmates of a lunatic asylum than of rational men—well, the better for the reputation of the professional side of the electrical industry. The gas industry, in its publicity methods, courts the fullest investigation by the public, just as it has courted in vain public demonstration (under proper auspices) of its claims that it can give a better quality of light than electricity; that, light for light and time for time, its inverted incandescent burner is more economical than the metallic filament or any other electric lamp; that the heating efficiency of its appliances is greater, and the cost lower, than heating by electricity; that its means of cooking (including all the work done on the top-plate) is a money and time saving process; that it can develop greater horse power at a given price than electricity; and that for water-heating in bulk and in small quantities, in both cost and time, electricity takes a very distant place from gas.

Workmen's Cottages.

We have not heard much about the electric lighting of the houses of working class people of late. Experiences have not been encouraging. The electric prepayment meter is expensive, its internal disorders are somewhat frequent. The fixed price proposition has also been a weakly sort of thing, and has never succeeded in getting a firm foothold; and, at the prices at which it has been worked, it has resulted in loss, or has only succeeded in making both ends meet, by calculating a finely cut, and in some cases inadequate, sum as the charge for interest and sinking fund. The experience in some cases has led to entire abandonment; and in others, there has been no further effort at extension. In certain instances, too, the fixed prices have been increased, which has been an effective mode of getting rid of an unprofitable class of consumer. We have our attention once more directed to the subject by an announcement in an electrical paper to the effect that the Swansea Housing Committee have decided to make arrangements for wiring municipal workmen's houses, and for supplying current to six lamps per house, at an inclusive cost of 1s. 2d. per week for current, interest, and sinking-fund charges on wiring, maintenance, &c. It does not say, in the paragraph before us, what the candle power of these lamps is to be. If the lamps are anything under 50-candle power for the ordinary rooms in which work is done, then we pity the people who tie themselves up to the scheme. If the installation does not include proper globes for the protection of the eyes of the working man and his family, we can increase the pity for them. The price to be charged for these six lamps of unknown candle power works out to £3 os. 8d. a year. If the gas industry could get this sum as the average from all prepayment consumers—not only for lighting but for cooking—it would swell with even greater financial importance than at present.

Hotel Heating Service.

The electrical industry follows the gas industry. Some time ago, the ingenious "taxi-meter" for use with gas-fires fixed in hotel, club, and boarding-house bedrooms was introduced to the gas industry. The electricians are following this lead. In the solemn belief that the electric "radiator" is the thing that will give immediate heat in an hotel or club bedroom, and a fan is the thing that will keep the air of a bedroom in motion and cool in the summer time, a prepayment attachment has been devised for the purpose of allowing guests to have the use of the one or the other at will—that is to say, if nothing is out of order. We learn that the new attachment consists of a small box, which is connected to the radiator or the fan circuit, and comprises a time-switch, which can be set to enable the radiator to be at the service of the guest in the hotel bedroom for any predetermined time. The coin for which the apparatus is designed is placed in the slot, and the handle is turned. The radiator or fan is then available for the number of hours for which the apparatus is set; and upon the expiration of the time, if all works as intended, the apparatus is automatically switched off, and is then ready for further use, necessitating the insertion of a second coin. Clockwork devices have been previously tried, but they have had their objections and failures. In the new device, the measure of time is obtained by the flow of liquid from a higher chamber to a lower one until the balance is upset by gravity. The apparatus with its cover is contained in a box measuring 8 in. by 5 in.; and it is proposed that by it a three-hour service shall be given for 6d. Therefore, if the hotel keeper pays 1d. per unit for current, and a four-lamp radiator is used, he would make 100 per cent., from which to take a profit and pay for the capital, depreciation, and repair charges. Looking at the complicated construction of the arrangement, we foresee the repair charges mounting up to a material sum.

Competition.

Further illustration is seen of the course that lighting competition is taking. In street lighting in various places, heavy capital outlay or expenditure from the rates is still being made in connection with conversion from gas to municipal electricity; and yet the electrical departments are not adding to profits by the process—in fact, the public lighting being principally required at the same time as the peak of the private lighting load, there is in most cases a dead loss on the current, which must be borne by the other patrons of the undertaking, in addition to the original expenditure, or charges incurred by the expenditure, on conversion. From more than one place, we hear of great dissatisfaction on the part of the ratepayers with the effect of the change from the street-lighting efficiency point of view. In many streets 32-candle metallic filaments are fixed with their poor distributing power, for the purpose of economizing, in order that the lighting rate shall not be more, at a low charge per unit, than formerly with the old upright incandescent gas-burners—not high-efficiency inverted gas-burners. In one district in London where the competition for shop lighting has resulted in placing several high-pressure and high-power low-pressure gas-lamps in position, the street arc lamps have been changed to clusters of three metallic filaments on the old arc lamp standards. If the old arc lamps were a disgraceful system of street lighting, these clusters of three metallic filaments are worse; and the local authority ought to be positively ashamed of them. If it were not for the improved shop lighting, the street—a main thoroughfare—would be about as unattractive at night time as it is possible for a street to be. Talking of shop lighting, gas managements who are not looking after this branch of the business, and making the most of the high-pressure system or the high-power low-pressure system, are acting very foolishly. The electrical people are trying to get more of the business by the very methods adopted by the gas industry; but where there is enterprising action on the part of the gas undertaking, there is little success. At Barnes, an effort is being made to increase the output of the electricity undertaking. But the Electrical Engineer reports very poor replies to a letter he sent to tradesmen explaining the system of hire-purchase of arc lamps. This is very satisfactory.

"Transactions" of the German Association of Gas and Water Engineers.

We have received the report of this Association for 1912 and a full account of the fifty-third annual general meeting held in Munich last year. The volume opens with the general report of the Committee for the year, including statements of the various accounts. Reports by the several Technical Committees follow, and then an account of the business transacted at the last meeting, with abstracts of the papers read. The next section is devoted to the papers, which are given in full as they were read at the meeting, and are illustrated. Abstract translations of the most interesting of these were given in the "JOURNAL" at the time of the meeting, and they need no further reference here. The rest of the space is devoted to the rules of the Association (including some alterations and additions), and lists of members—private, companies, and municipal officers. The whole volume, neatly bound in cloth, contains 698 pages and 132 illustrations, as well as 7 folding plates and tables.

Temperatures in the Centre of Vertical Retorts.

The Borough Analyst of Burnley (Mr. Raymond Ross, F.I.C., F.C.S.) has lately carried out, in conjunction with the Gas Engineer and Manager (Mr. John P. Leather), some experiments on the temperatures which exist at various depths in the centre of the vertical retorts at the gas-works. The experiments were made by means of a 25-feet pyrometer, which is probably the longest ever used in any such experiments; and considerable difficulties had to be overcome in carrying out the determinations. The retorts are 25 feet from base to top, and the average results obtained were as follows:

Depth below Rodding Holes. Ft. In.		Temperature in Degrees Centigrade.	Depth below Rodding Holes. Ft. In.		Temperature in Degrees Centigrade.
21 4	..	891	11 6	..	875
19 4	..	894	9 6	..	791
17 4	..	905	7 6	..	715
15 4	..	667	5 6	..	520
16 8	..	600	3 6	..	316
15 6	..	745	2 6	..	298
13 6	..	735			

Two 500 H.P. gas-engine generating sets have lately been put to work on coke-oven gas at the Grassmoor Colliery, Chesterfield. They have cylinders 15½ and 16½ inches diameter for the lower and upper cylinders respectively, with a 16-inch stroke. They develop 500 B.H.P. full load at 300 revolutions per minute, and are capable of carrying 10 per cent. overload for periods of two hours. The jacket-cooling water is circulated by two 3-inch Gwynne centrifugal pumps, driven at 1400 revolutions per minute, by direct-coupled 8 H.P. Westinghouse squirrel-cage motors, at 440 to 460 volts, 50 cycles. The pump motors are controlled from Westinghouse unit-type control panels. Each pump, and the cooling-tower, will deal with 12,000 gallons per hour, reducing the temperature of this quantity of water from 135° to 80° Fahr., with an atmospheric temperature of 60° Fahr.

HYGIENIC AND HEATING EFFICIENCIES OF GAS-FIRES.

BEING A REPLY TO MR. YATES'S LETTERS OF MAY 6 AND MAY 27 RESPECTIVELY.

By the Davis Gas-Stove Company, Limited.

Position of the Controversy.

Before going further into the question of hygienic gas-fire construction, it would be well to review briefly the position of the discussion which is taking place on this matter, which arose out of a statement by Messrs. John Wright and Co. published in the "Journal" for Sept. 3, 1912, "that a fire, for instance, which carries off all its products without being attached to a flue will [the firm submit] when the ordinary chimney draught comes into play inevitably carry off more than the products—to wit, an unnecessary number of heat units as well, and a lower heating efficiency is the result."

This was distinctly refuted by ourselves; and we claimed that not only did the fires of our construction pass the whole of their products through the flue outlet unassisted by artificial draught, but that they were capable of passing a large volume of air through the flue outlet without affecting the radiant efficiency. And although the points at issue are perfectly clear, and Mr. Yates, on the 27th of May, in the "Journal" stated that he could not allow either ourselves or any of his other opponents to confuse the original issue or to run away from it, he deliberately introduces and emphasizes side-issues not in any way bearing upon the subject under discussion.

Having been challenged from time to time to support his statement, Mr. Yates on May 6 communicated a letter to the "Journal" stating that his contention had been investigated by Professor Bone; and he published a letter from the Professor supporting his views. In the same communication Mr. Yates made certain statements which it will be necessary to deal with later, after the main issue has been disposed of. In the communication of May 6 no figures were given; and on being called upon to do so, both by the Editor of the "Journal" and by ourselves, a letter from Mr. Yates appeared on May 27, in which Professor Bone kindly allowed the publication of certain figures, and a very few facts relating to the tests upon which his opinion (previously published) was chiefly based.

Professor Bone's Tests and Opinion.

Two gas-fires—a "Davis" and a "John Wright"—were each tested under three different circumstances set out by Messrs. John Wright and Co. as follows.

(*a*) Without any flue attachment at all—the products of combustion simply passing away through the flue vent of the fire unaided by any flue draught. [Here we have an assertion by Mr. Yates that the products of combustion were passing away through the flue-vent unaided by flue draught. This we challenge Mr. Yates to prove in the case of the 10-inch "Wizard" fire under test.]

(*b*) Under moderate flue draught—the fire being connected by means of a 3 ft. 10 in. length of lagged flue pipe to a brick chimney 25 ft. 9 in. high above the point of entry of the flue-pipe.

(*c*) Under strong flue draught (with similar arrangement as in "B"), which reduces the percentage of CO_2 in the flue products to approximately one-fourth that found in Series "A" in each case. [In the case of Wright's fire, it reduced the percentage of CO_2 in the flue products to an amount frequently found escaping in front of the canopy of this fire unless flue attachments are used.]

The issue submitted to Professor Bone is the outcome of two claims made by ourselves on July 30: Firstly, that the new construction satisfied the proposed new standard of hygienic efficiency—viz., that, without the aid of any flue attachment whatever, all the products of combustion shall pass away through the flue-outlet [now supported by Professor Bone]; and, secondly, that the space allowed between the front edge of the canopy and the refractory mantle is carefully proportioned so as to allow a large volume of ventilating air to be drawn into the flue without in any way affecting the radiant efficiency of the fire.

Professor Bone, as the result of his investigation, published an opinion on May 6, wherein he expressed himself satisfied that the contention of Mr. Yates, that a fire capable of passing the new hygienic standard was bound to be detrimentally affected by the action of flue draught, and that nothing had been brought to light in his investigation to justify him recommending modifications in the construction of any of the fires of John Wright and Co. in the directions recently advocated in the Technical Press. This opinion is supported by Mr. Yates, in a letter published on May 27, by the figures given in Table I.

An Examination of Mr. Yates's Comments on Professor Bone's Figures.

Mr. Yates, referring to these tests, states that the figures hardly need comment to bring out their full significance; but, for all that, he proceeds to indicate not only their significance, but many points having no bearing whatever on the subject of the discussion. We, on our part, think they require a considerable amount of comment, as they are so framed as to leave obscured certain points which we believe the industry will find decidedly interesting.

As it would make the figures much clearer if stated in terms of actual values, we have set up a heat-balance. But to do this in the absence of any details, it is necessary to make certain assumptions. For this purpose we would refer your readers to the "Journal of Gas Lighting" of Oct. 24, 1911, in which appeared an article by Mr. Yates on the making of "Gas-Fire Burners." Under the heading of accounting for the heat units, we find the following:—

> "It is absolutely essential that a fair percentage should be allowed to escape by the flue to cause a proper 'pull' in the chimney, so as to ensure all the products of combustion being carried away, and none escaping into the room, and further to assist in the proper ventilation of the apartment. For this, anything from 15 to 25 per cent. must be allowed. At the present time we are regularly obtaining in our fires radiation as high as 55 per cent."

In view of this statement, we have assumed in test "A" of the 10-inch "Wizard" fire a total radiant efficiency of 55 per cent., and a flue gas loss of 20 per cent. With the aid of these figures, we have prepared a heat-balance, set out in Table II. in percentages. Table III. is a heat-balance set out in terms of British thermal units—assuming an hourly consumption of 25 cubic feet of gas generating 12,500 B.Th.U. per hour net; each cubic foot of such gas producing by combustion 0·5 cubic foot of CO_2, and 1·2 cubic feet of water vapour.

Some Significant Deductions.

With these figures, one or two rather significant facts may be brought forward. Firstly, that in the case of test "B" of the 10-inch "Wizard" fire, as compared with test "A," only 92 per cent. of the original radiant heat is available; whereas in the case of the Davis fire 96·4 per cent. of the heat originally radiated is still available. This means, on the assumed efficiencies set out, that the influence of flue draught in test "B" is to reduce the radiant efficiency of Wright's fire by 4·4 per cent.; whereas in the case of the Davis fire, the reduction is only 1·65 per cent. As the flue draught applied in test "B" represents what we consider to be the extreme limit of draught which should be applied to a gas-fire if properly fitted (and if of such construction as to allow this correct method of fitting to be used), it is obvious that the fire of Messrs. John Wright and Co. is, under normal circumstances, much more liable to a loss of radiation through the chimney draught than is the Davis fire.

The figures of series "C" are doubtless introduced to disprove a claim which we have never made—viz., that the fires of the Davis series are capable of maintaining their radiant efficiency when a decidedly excessive and abnormally strong draught is applied. The extremely low percentage of CO_2 in the flue products is a clear indication of the absurd amount of air which is in this instance being caused to pass through the fire. This is further illustrated in the set of figures given in Table IV., showing the total volume of flue gas products in each list. We do not imagine that any member of the gas engineering profession will fail to realize how absurd it is to expect a 10-inch fire to pass through its flue-outlet approximately 1500 cubic feet of air and products per hour which, if correction be made for the temperature at which the products are delivered, represents a volume of no less than 2127 cubic feet in the case of the Davis fire, test "C." It is a volume totally disproportionate to the size of the fire. Really we cannot pay any serious attention to the figures given in test "C," as they only represent totally abnormal conditions which no reasonably intelligent gas-fitter would allow to be applied to the flue-outlet of any gas-fire. To put forward such a test might be taken to indicate great lack of knowledge on the part of Messrs. John Wright and Co. as to the correct method of fitting a fire with a view to proper ventilation of the room—a subject with which we deal more fully later in this article.

Inconsistencies, and Points in Favour of the Davis Fire.

But apart from this, there are points to be raised in connection with the figures published, which lead one to the conclusion that they are so inconsistent and opposed to what one might reasonably expect to find as to render them of very little value whatever. Taking test "B," as compared with test "A," we find that the 10-inch "Wizard" fire has lost a certain percentage of radiant efficiency, which can only have been taken into the flue-outlet, and must therefore (if the figures are correct) account for a similar rise in the percentage of flue gas losses, which must also be augmented by the heat carried away by the increased amount of air drawn through the flue-outlet. Peculiarly enough, we find that the increase in the flue gas loss is actually materially less than the decrease in the radiant efficiency. On referring to Table III., it will be seen, on comparing test "B" with test "A" of the 10-inch "Wizard" fire, that the action of flue draught accounts for a loss in radiant heat of 550 B.Th.U., whereas the increase in flue gas losses only accounts for 250 B.Th.U.—leaving unaccounted-for 300 B.Th.U., *plus* the amount of heat carried to the flue by the additional air drawn in by the action of the chimney draught, which in Table IV. will be found to be 683 cubic feet. The effect of this discrepancy is to show a rise of 2·4 per cent., or 300 B.Th.U. in the percentage of convected heat; and we submit that it is absurd to rely on figures which show the action of flue

draught upon a gas-fire to be increasing the percentage of convected heat which the fire is giving off, particularly when the application of further draught to the same fire is responsible for a loss of no less than 1556·25 B.Th.U. in the heat convected. [See Table III., test "C," 10-inch "Wizard" fire.] This, we contend, is an entirely unsatisfactory and contradictory statement.

Now turning to the test of the Davis fire, the influence of the flue-pipe used in test "B" is only responsible for a decrease of 1·5 per cent. in the radiant efficiency—representing a falling off of 206·25 B.Th.U. This, however, is accompanied by a rise of no less than 5 per cent. in the flue gas losses, representing an actual increase of 500 B.Th.U., and leaving 293·75 B.Th.U. to be carried away by the smaller additional amount of air induced—shown in Table IV. as being 422 cubic feet. This has the effect of reducing the convected heat by 2·35 per cent.—an entirely opposite effect to that produced in the case of Wright's fire.

Further, we find that the induction of the first quantity of air by the flue applied in test "B" is responsible for a very material drop in the radiant efficiency in the case of Wright's fire, whereas the application of further draught in the case of the same fire is only responsible for a minute drop. This is contrary to what one would reasonably expect, and in the case of the Davis fire, we find that the flue draught first applied has only a very slight effect upon the radiant efficiency, whereas the application of a further draught is said to have a very pronounced one.

In test "C," as compared with test "B" of the 10-inch "Wizard" fire, there is an increase of 1625 B.Th.U. in the flue gas losses; the reduced radiant efficiency shown in the tests adding only 68·75 B.Th.U., and leaving a balance of 1556·25 B.Th.U. to be accounted for. Table IV. shows that the amount of additional air induced is only 584 cubic feet; whereas in the case of the same tests of the Davis fire, there is an increase of 1875 B.Th.U. in the flue heat losses, 893·75 of which are said to be due to lowered radiant efficiency—leaving a much smaller balance of only 981·25, although the quantity of air induced is considerably greater, and will be found in Table IV. to be no less than 664 cubic feet.

These results, to our mind, require very careful explanation before they can be accepted; and we consider that the points brought to light are sufficient to show that the figures published, unless supplemented by much other important data, cannot be relied upon in any way. With this feeling in our minds, we have now placed the whole matter in the hands of Mr. W. J. Atkinson Butterfield, M.A., F.I.C., to investigate the subject in his own way, and report his findings to us, so framed that they can be published. The publication of them will enable the whole gas industry to realize exactly how the tests were carried out, and what they show, and give information which will enable any gas engineer to undertake similar tests under his own local conditions.

Ventilation—Correct and Incorrect.

Having dealt with the figures given by Mr. Yates in his letter of the 27th of May, there are some points which require further attention, on account of the attitude taken up by him, and through the introduction on his part of certain side-issues, not bearing directly upon the subject of this discussion.

Mr. Yates in his remarks concerning the relative hygienic efficiencies of the fires tested, demonstrates in our opinion a lack of knowledge on the subject of correct ventilation. It has been our contention throughout that a gas-fire should not be so fitted that the whole of the air passing to the chimney for ventilating purposes should be caused to pass through the flue-outlet of the fire itself; but that it should be so arranged that there is a free passage for air to the chimney around the fire, which will allow ventilation to take place, both when the fire is in use and when extinguished. This view has been repeatedly put forward upon the lecture platform, and is one that has been supported by some of the most prominent gas engineers of this country. Mr. Yates, however, appears to only take into consideration the ventilation of the room through the gas-fire flue-outlet, and on this assumption expresses his opinions.

It is true that there are on the market to-day certain gas-fires the construction of which demands that a strong draught be applied to the flue-outlet, to ensure the removal of the products, and to prevent their escape into the room. We feel strongly that this type of fire has given rise to the practice of closing, by means of the sheet-iron plate, the entire opening of the coal-grate, with the exception of a small hole cut away to allow the fire-flue to connect direct to the chimney. This method of fitting has been persistently discouraged by us. We admit, however, that, so long as gas-fires are constructed to allow the products of combustion to escape into the room from beneath their canopies, and have to be fitted, this defective method is likely to continue in use. We actually know of cases where this method of fitting is adopted, with fires having circular flue-outlets less than 2½ inches in diameter, in which case the restriction of the ventilation is obvious.

With the hygienic fire as constructed by ourselves, the correct method of fixing can be adopted, and effective ventilation of the room at all times ensured, even though the quantity of air passing through the fire is at no time excessive. Under these conditions, Professor Bone's figures published on May 27 show that the radiant efficiency is not so susceptible to diminution as in the case of the 10-inch "Wizard" of John Wright and Co. We claim that this ability to completely remove the whole of the products without closing the coal-grate opening, and at the same time to effectively ventilate the room without passing an excessive amount of air through the fire itself, is by no means the least of the advantages resulting from the use of the hygienically perfect fire, constructed to carry away the whole of its products through the flue-outlet unaided by chimney draught.

Radiant Efficiency.

We next come to the question of radiant efficiency, and would state at once that the comparative radiant efficiencies given by John Wright and Co., in their letter of May 27, are far from being in agreement with those obtained in our laboratories. As already stated, this matter has been placed in the hands of Mr. Butterfield for further investigation.

Although not actually stated, it is doubtless suggested that the alleged lower radiant efficiency is due to the particular construction of the fire adopted to ensure hygienic perfection; but not one vestige of proof on this point has been brought forward. We feel that the only way that this could possibly be done is by removing the upper portion of the fire, and having in its place a canopy chamber and flue-outlet similar to that used in the 10-inch "Wizard," under which conditions the radiant efficiency of the two fires would be identical. Unless this can be shown to be the case, the alleged lower radiant duty cannot be said to be due to the hygienic construction of the fire. But even assuming (while not admitting) a reduction of 4 or 5 per cent. in the radiant efficiency due to the lowering of the canopy, and its greater projection in front of the burner line, we contend that this is a theoretical reduction only, and that the portion intercepted by the canopy, if allowed to escape into the room, would be directed immediately to the ceiling of the room, and would have little use as regards influence on the general heating effect obtained; and that while the total radiant efficiency might be lower by 4 or 5 per cent., the room heating efficiency of the fire would not be materially reduced.

Constructional Points.

In his article of May 6, Mr. Yates makes certain statements concerning the distinctive features of the new construction, which points to a decided lack of knowledge on this particular subject. He sets out the following points as being three distinctive features of the new construction.

1.—An oval flue-outlet.
2.—The placing of the flue-outlet at the highest point of the canopy chamber and other arrangements for securing the entire absence of pockets in the canopy.
3.—The extension of canopy, and its prolongation downwards, so that it nearly overlaps the top of the radiants.

The first item requires no further mention; but, in commenting on the second, Mr. Yates asserts that, "although insisted upon as a necessary condition, it is not carried out in its entirety, for all their [the Davis] fires certainly have pockets." We do not in any way accept this statement, and would ask Mr. Yates to verify his assertion that the fires referred to "certainly have pockets."

While dealing with this question of necessary conditions, we would like to remind Mr. Yates that in September, 1910, the firm he represents distinctly stated that one of the indispensable points of every good gas-fire was that it should have "no products of combustion escaping beneath the canopy," and further that this, with the other eight indispensable points, were to be found in the "Thermo X" series of fires, and in them only. Here we have a direct assertion. In view of this, Mr. Yates may be asked to prove that in the "Thermo X" series of gas-fires no products of combustion can be found escaping beneath the canopy; and to explain further his present antagonistic attitude to the inclusion in our fires of the feature in construction which in September, 1910, his firm claimed as being an indispensable and vital point in the construction of a good gas-fire.

There are, however, other points bearing on the hygienic construction which Mr. Yates apparently fails to appreciate. One of the most important is the vertical distance from the under-side of the canopy edge to the effective centre of the flue-outlet, representing the height of a small chimney formed by the canopy chamber, which, in conjunction with the effective area of the flue-outlet itself, governs the capacity of this small chimney to effectively deal with the flue gas products.

Again, the construction of the brick is a feature of great importance. In some fires it directly assists the products of combustion to escape beneath the canopy; while in others it acts as a decided obstruction to the passage of the products of combustion to the flue-outlet. Another feature is the extent to which the canopy is caused to project in front of the burner line. Some designers cause this projection to be greatly reduced at the extreme ends of the canopy—immediately over the end jets of the burner. This is a feature in design which might well be improved.

While omitting to mention and take into account these very important points, Mr. Yates mentions the prolongation of the canopy downwards as a necessary feature. We would remind him that this has never been claimed by us as an essential feature of hygienic construction; and we are prepared to say and to show that a 10-inch gas-fire can be constructed with the distance from the bottom edge of the canopy to the top of the radiating material measuring 3⅜ inches, as in the case of the 10-inch "Wizard," and still be capable of removing the whole of its products by way of the flue outlet unaided by chimney draught.

In dealing with this matter, we are sorry to say that Mr. Yates has attributed to us a motive quite unwarranted. We have at no time endeavoured to "rush" this matter on the gas engineering

profession, or to damage our competitors' trade interests. The whole matter has been dealt with without reserve; and our competitors are welcome to visit our laboratories and discuss the question with us—taking advantage of any information which we are in a position to supply. Some of our competitors—and it has been a pleasure to us—have availed themselves of this opportunity, and have expressed themselves well satisfied with the time spent in our laboratories.

Professor Bone's Figures and Our Interpretation.

Table I.

Figures as published by Mr. Yates in the "Journal of Gas Lighting" for May 27, on which Professor Bone's opinion published in the "Journal" of May 6, was chiefly based.

Tests with Fire X. (Davis No. 1 "Vesta.")

—	A.	B.	C.
Percentage CO_2 in flue products	3·43	1·60	·87
Temperature of flue products—C°	270°	163°	140°
Relative radiant efficiency*	·84	·81	·68
Relative flue heat loss (approximate) †	1·20	1·40	2·15

Tests with Fire Y. (Wright's 10-inch "Wizard.")

—	A.	B.	C.
Percentage CO_2 in flue products	3·17	1·17	·76
Temperature of flue products—C°	217°	103°	100·7°
Relative radiant efficiency*	1·00	·92	·91
Relative flue heat loss (approximate)†	1·00	1·10	1·75

* Expressed as a ratio of *highest* radiant efficiency observed—namely, in Y.A. experiment.
† Expressed as a ratio of *lowest* flue heat loss observed—namely, in Y.A. experiment.

Table II.

Assuming in List A of the "Wizard" fire a total radiant efficiency of 55 per cent. and a total flue gas loss of 20 per cent., and a total generation of 12,500 B.Th.U. per hour, net value, Table I. gives a heat balance in percentages, and Table II. a heat balance in B.Th.U. per hour.

In considering the figures, we should like to particularly emphasize the point that they merely show our interpretation (under the foregoing conditions) of Professor Bone's figures. The independent tests that are being carried out for us by Mr. Butterfield will, we have confidence, materially alter the complexion of these results.

10-inch "Wizard" Fire.

—	A.	B.	C.
Radiant efficiency	55·0	50·6 − 4·4	50·05 − ·55
Flue gas losses	20·0	22·0 + 2·0	35·00 + 13·0
Total	75·0	72·6	85·05
Balance convection	25·0	27·4 + 2·4	14·95 − 12·45
Grand total	100·0	100·0	100·0
Radiation convection given total efficiency	80·0	78·0 − 2·0	65·00 − 13·0

Davis "Vesta" Fire.

—	A.	B.	C.
Radiant efficiency	46·2	44·55 − 1·65	37·4 − ·7·15
Flue gas losses	24·0	28·00 + 4·0	43·0 + 15·0
Total	80·2	72 55	80·4
Balance convection	29·8	27·45 − 2·35	19·6 − 7·85
Grand total	100·0	100·00	100·0
Radiation convection given total efficiency	76·0	72·00 − 4·0	57·0 − 15·0

Table III.

10-inch "Wizard" Fire.

—	A.	B.	C.
	B.Th.U.	B.Th.U.	B.Th.U.
Radiant heat	6,875	6,325 − 550	6,256·25 − 68·75
Flue gas losses	2,500	2,750 + 250	4,375·00 + 1625
Total	9,375	9,075	10,631·25
Convected heat	3,125	3,425 + 300	1,868·75 − 1556·25
Grand total	12,500	12,500	12,500·00
Radiation and convection giving total heat available to room	10,000	9,750 − 250	8,125 − 1625

Davis "Vesta" Fire.

—	A.	B.	C.
	B.Th.U.	B.Th.U.	B.Th.U.
Radiant heat	5,775	5,568·75 − 206·25	4,675 − 893·75
Flue gas losses	3,000	3,500·00 + 500	5,375 + 1875·0
Total	8,775	9,068·75	10,050
Convected heat	3,725	3,431·25 − 293·75	2,450 − 981·25
Grand total	12,500	12,500·00	12,500
Radiation and convection giving total heat available to room	9,500	9,000 − 500	7,125 − 1875

Table IV.

Assuming an hourly gas-rate of 25 cubic feet and each cubic foot of gas producing 0·5 cubic foot of CO_2 and 1·2 cubic feet of water vapour, gives the total volume of flue gases including water vapour in air of normal saturation (taken from tables in Mr. Butterfield's article upon the "Shadowgraph Test" in the "Journal of Gas Lighting" dated Nov. 12, 1912.

For Wright's Fire.

A.	B.	C.
430 cubic feet	1113 cubic feet + 683	1697 cubic feet + 584

For Davis Fire.

A.	B.	C.
400	822 + 422	1486 + 664

Tidal Waters as a Source of Power.

This was the subject of an interesting paper read at one of the reeent meetings of the Society of Engineers, by Mr. C. A. Battiscombe. The author claimed that the utilization of the tides for power purposes presents few engineering difficulties as far as principles are concerned, but that the real difficulty lies in the question of cost, and therefore in the choice of the site and in the design of the structural details. Some explanatory remarks were offered in respect to various items given in a rough estimate for a proposed installation for any range of tide; the cost of a Board of Trade unit of electricity obtained thereby being considered from the point of view of supply and demand, both from a commercial and a municipal standpoint, on the basis of annual expenditure over a period of fifty years. The author concluded by insisting on the importance of regarding the supply of fuel as a matter concerning the whole nation; that the demand for combustible fuel is continually increasing; and that coal being practically the only fuel found in England, it would be mere folly to neglect any other available source of energy whereby the present rate of consumption of coal may be sensibly reduced. It was submitted that not only can the tides be utilized as a constant source of power, but that, taken in conjunction with the power that could be derived from fresh-water rivers, their utilization would be a great gain to both the commercial and industrial interests of the United Kingdom.

The Vagaries of the Electric Light.

One of our readers informs us that, on the invitation of the Italian Gas Managers' Association, he recently attended a meeting at the Town Hall, Brescia, at which in the morning a very interesting paper was read by Mr. De Jong, the General Manager of the Rome Gas Company, on the subject of "The Importance of Gas Companies Educating the Public to Appreciate the Uses of Gas for Cooking and Heating Purposes." It would thus appear that the influence of the British Commercial Gas Association was reflected in the minds of many Italian gas engineers. In the evening a dinner was arranged for at the Hotel de l'Italie, Brescia. The proprietress of the hotel was evidently not accustomed to providing a big dinner, as it became necessary for the guests to wait a considerable time before even the soup was served. Unfortunately, and just when the members were becoming very impatient, the electric light all over the hotel went out; and after waiting for some three-quarters of an hour in darkness a large number of candles (without candlesticks) were brought into the room and placed in wine-bottles or any other receptacles in which they could be made to stand up. No sooner, however, had the candle light been installed than up went the electric light again. In the meantime, the cooks in the kitchen had left their work; and it was well on towards midnight before the dinner was finally served. Meanwhile, the mayor of the town and the head of the electrical undertaking, who were to have been guests at the dinner, had left in anything but a happy state of mind.

CRITICISMS OF RECENT PROPOSALS CONCERNING GAS-FIRE CONSTRUCTION.

By H. James Yates, of Birmingham.

[Note by the Editor: As Mr. Yates appears to think that he is placed at some disadvantage by editorial comment preceding his communications on the subject under discussion—an unexpected admission from him!—we have given his present communication a more prominent position than the "Correspondence" columns, and, moreover, have not made any extended comment upon it in our leading columns. That is unnecessary, as Mr. W. J. A. Butterfield is carrying out exhaustive tests for the Davis Company; and the publication of the results will reduce the matter simply to one of comparison between Professor Bone's figures and those of Mr. Butterfield. An article by the Davis Company is published this week, in answer to what has been previously published by Mr. Yates; and the Davis Company's article will, in a substantial way, bridge-over the interval between now and the time when Mr. Butterfield's test results are able to be published.]

Once more I find that the earliest and practically the only antagonism I have to deal with is not the *ex parte* views of Messrs. Davis, but what you still describe as "the judicial attitude of the 'Journal.'" After a week, Messrs. Davis write only a few perfunctory lines to say that they have nothing to say—so zealously does the "Journal" fight the battle of this particular firm.

As regards the "Journal," it is quite clear that if care be not taken, the definite issue originally raised will be lost sight of. Before I go further, therefore, the real question at issue must be once more—and, so far as I am concerned, once for all—made clear.

The "Journal" persists in saying that the "original contention" was my statement that "a fire that carries off all its products without being attached to a flue will, when the ordinary chimney draught comes into play, inevitably carry off more than the products—to wit, an unnecessary number of heat units as well." I must correct the "Journal" here. The passage quoted by the "Journal" is *not* the "original contention." There is no mystery about the "original contention." It was first put forward on the 30th of July last, in the shape of an article in the "Journal" announcing that Messrs. Davis had produced a fire which disposed of all its products by the flue vent without the aid of flue or chimney, and claimed that "the space between the front edge of the canopy and the refractory mantles is carefully proportioned to allow a large volume of ventilating air to be drawn into the flue without in any way affecting the radiant efficiency of the fire." That was the "original contention;" and, if proved, it was one of great importance. My statement, which the "Journal" calls the "original contention," appeared on Sept. 3. It was only made in reply to that "original contention" of Messrs. Davis, but for the previous appearance of which there would have been no occasion for my making it.

Now let me emphasize the importance of this correction. When Messrs. Davis's "original contention" appeared, with its sweeping claim, they offered no facts, figures, arguments, or authority whatever in support of that claim. The "Journal" made a favourable comment on the new proposals, and never hinted "in the interests of scientific truth" a request for proofs of Messrs. Davis's sweeping claim. That claim I disputed; and in doing so, I made the statement which the "Journal" is now so anxious to treat as the original issue. At once Messrs. Davis challenged me to *prove my negative* of their own *unproved* claim. I have made it clear that not my statement, but Messrs. Davis's was the original issue. I hold them, and their editorial champion, to that statement of theirs, which they have never yet attempted to prove.

That Messrs. Davis had produced a type of fire which passes all its products without flue or chimney, I never doubted or disputed. There is nothing easier than to make a fire which will do this. As a matter of fact, all my own firm's fires can be supplied in that way, for such as may desire it. What I could not agree with was Messrs. Davis's further statement—viz., that their new type of fire does not sacrifice radiant efficiency. I pointed out that where the canopy extends close down to the radiants, as in their construction, the rush of air over the radiants helps to cool them; and the lowering of radiant efficiency in this way obviously involves a loss of actual heat units through the flue vent, and Professor Bone's investigations reveal the fact that I was right. As regards the sacrifice of radiant efficiency, the "Journal" would now seem to be half-inclined to agree with me; for you speak of fires discharging all their products by the flue vent, "without loss, or *without any considerable loss*, of radiant efficiency," and speak, again, of *forfeiting*, "if necessary, a little *radiant efficiency*."

The issue being once more cleared, I come to my own much-quoted statement, and your comments on Professor Bone's figures. But before doing so, I owe it to myself to point out that for some years past I have been advocating—among numerous points needed to improve the gas-fire, and since embodied in the types of to-day—that all fires should be so constructed that when connected to a chimney that has no down-draught, they should remove all their products by the flue vent, and allow none to escape from under the canopy. It is some encouragement to see that this view has both impressed manufacturers and the "Journal."

In criticizing Professor Bone's report, you first of all broadly hinted that I had not submitted the true issue to Professor Bone, and demanded to know what issue *had* been submitted to him. That was an imputation upon my good faith; and as I have since pointed out, it was made in the face of the clear statement in my article of the 6th of May that the exact wording of the issue, and the whole history of the controversy, had been laid before Professor Bone.

You next called for figures in support of Professor Bone's report; and these having been given, you now state that the manner of the tests "abuses the intention of the particular construction" proposed by Messrs. Davis, because there were tests made of the Davis type with flue pipe, the need and use of which they disclaim. What is a reader likely to infer from your statement? Once more that I have acted in bad faith, in respect that the fires were tested under improper conditions, so as to give misleading results. That is a style of controversy which nothing could justify but facts. What *are* the facts?

Will it be believed that, notwithstanding your way of putting it, the Davis fire *was* tested without flue pipe, *and the table of results says so!* Yet you assert that the point in dispute has not been tested, and propose to brush aside, as so much waste paper, all Professor Bone's report and figures—the very figures you called for! You further advise Messrs. Davis to have an investigation by an "independent expert." That is their affair; but do you decline to accept Professor Bone as "an independent expert?" For Professor Bone's choice of tests, not I, but he alone is responsible. I can only judge of that choice, like others, from outside. You have taken exception to the use with the Davis fire of a short length of flue pipe attached to 25 ft. 9 in. of brick chimney. Let me again remind you of Messrs. Davis's explicit "contention" of July 30, from which this controversy arose—viz.:

(1) That there is a large volume of air drawn through the space between the canopy and the radiants.
(2) That the radiant efficiency of the fire is in no way affected thereby.

Let me also refer you to my article of May 6, in which my reasons are fully set forth for maintaining that with these fires a large volume of ventilating air drawn in under the canopy must necessarily cause a lowered radiant efficiency. You have never ventured to traverse this reasoning. The result of the reasoning was embodied in my much-quoted statement of Sept. 3, that when the ordinary chimney draught came into play, such fires would carry off an unnecessary number of heat units.

From the "A" tests carried out with the Davis fire—that is, without flue pipe, it will be seen that "a large volume of ventilating air" is *not* being drawn up the flue—as shown by the percentage of CO_2. Now in my statement of Sept. 3 last year, I said, "When the ordinary chimney draught comes into play." It was doubtless for no other reason than in order to bring the chimney draught into play, with a view to inducing the "large volume of ventilating air" *through the canopy*, that Professor Bone found it necessary to attach one end of a short length of flue pipe to the fire and the other end to the chimney [condition "B"]; the fire being, of course, in the proper position for determining its radiant efficiency by the method adopted by the Joint Committee appointed in 1907 by the Institution of Gas Engineers and the University of Leeds. In other words, this flue pipe formed a prolongation of the chimney itself, and was not thrust inside the chimney, as you possibly imagine. Under these ["B"] conditions, the ventilating air drawn in "between the front edge of the canopy and the refractory mantles" in the Davis fire was by no means a "large volume;" was less than in the Wright fire; and carried off more heat units than were removed by the Wright fire, under the same conditions.

You object to Professor Bone "abusing the intention" of the Davis construction. But the Wright fire does not require a total of 29 ft. 7 in. of chimney in order to remove all its products, as your way of putting it would convey. Why, then, if "abuse" it be, do you not "in the interests of fair play" equally object to him "abusing the intention" of the Wright fire? You have evidently overlooked the fact that Messrs. Davis themselves, in making comparative tests between their fire and another make, found it necessary to apply flue pipe to their own fire as well as to the other. [See their letter in the "Journal" for Oct. 22, p. 299.] From that letter I gather that these tests were put forward in the hope of disproving my much-quoted statement of Sept. 3.

Your position, therefore, comes to this, that Messrs. Davis may use flue pipe (as they cannot help doing) in *ex parte* tests intended to *disprove* my statement, but Professor Bone must not

use flue pipe in independent tests which *prove* that statement! In any case, in a difference of opinion on gas-fire testing between Professor Bone and the Editor of the "JOURNAL"—though I have always sincerely respected the Editor's views—I cannot but feel that "the technical men of the gas industry" will probably attach the greater weight to the opinion of Professor Bone.

Even apart from the above justification of the use of flue pipe, it is important to point out the result of comparing the Wright fire under "B" conditions—conditions unfavourable to it—with the Davis fire, under "A" conditions—which are favourable to it. The comparison, taken from Professor Bone's figures, is subjoined.

	Fire "X" "A" Test.	Fire "Y" "B" Test.
Percentage of CO_2 in the flue products. . .	3·43	1·17
Temperature of flue products—C°	275°	103°
Relative radiant efficiency	0·84	0·92
Relative "flue heat" loss (approximate) . .	1·20	1·10

From this comparison, it is found that three facts stand out which nothing can evade—viz., that the Davis proposed type, used without a flue pipe,

(1) draws a much smaller amount of ventilating air up the flue,
(2) has a decidedly lower radiant efficiency,
(3) loses more heat units up the flue.

With regard to the results of the "A" experiments with the Wright fire, you endeavour to "partly" explain these away by suggesting that in the absence of a flue pipe the composition of the products carried off through the flue vent may have been modified, in the direction of reducing its percentage of CO_2, by the escape of products from under the canopy. This is, of course, mere conjecture; and to dispose of it, I need only quote Mr. Butterfield's article in your columns on Nov. 12, p. 495, where he lays it down that "if this portion of the products [*i.e.*, any portion escaping under the canopy front] is more than a quite negligible proportion of the total products of combustion, it will have substantially the same composition as the portion which is removed through the flue vent." You will thus see that whether the *amount* of CO_2 going through the flue vent does, or does not, account for all the CO_2 produced, yet its *percentage*, and the temperature of the products—on which two factors the calculations of heat loss are no doubt based—are the same as though all were passing through the flue vent. So that this statement of Mr. Butterfield's, which you had doubtless overlooked, disposes of your conjecture.

I have now dealt with your criticisms, and they leave Professor Bone's figures unshaken. I am sorry it seems impossible to avoid quoting those figures once again—viz.,

TESTS WITH FIRE "X."

	A.	B.	C.
Percentage CO_2 in flue products .	3·43	1·60	0 87
Temperature of flue products—C°.	275°	163°	140°
*Relative radiant efficiency . . .	0·84	0·81	0·68
†Relative "flue heat" loss (approximate)	1·20	1·40	2·15

TESTS WITH FIRE "Y."

	A.	B.	C.
Percentage CO_2 in flue products .	3·17	1·17	0·76
Temperature of flue products—C°.	217°	103°	100·7°
*Relative radiant efficiency . . .	1·00	0·92	0·91
†Relative "flue heat" loss (approximate)	1·00	1·10	1·75

* Expressed as a ratio of the *highest* radiant efficiency observed—namely, in Y A experiment.
† Expressed as an approximate ratio of the *lowest* "flue heat" loss observed—namely, in Y A experiment.

The points which these figures prove are:

I.—*Ventilation* (from "percentage of CO_2 in products").
(*a*) That a *small* volume of ventilating air is drawn through the canopy and not a large volume, as claimed by Messrs. Davis.
(*b*) That under all similar conditions, A and A, B and B, C and C, a *smaller* volume of ventilating air is drawn through the canopy of the Davis fire than through the canopy of the Wright fire.

II.—*Heat Units Removed* (from "relative flue heat loss").
(*a*) That whatever the volume of ventilating air, the heat units removed by the Davis fire are always greater in number under equal conditions (A and A, B and B, C and C), than those removed by the Wright fire.
(*b*) That even under unequal conditions—viz., X A compared to Y B—when the Davis fire is removing only approximately half the amount of ventilating air that the Wright fire is removing, it [the Davis] removes 10 per cent. more heat units than the Wright fire.

III.—*Radiation* (from "relative radiant efficiency").
(*a*) That under no conditions of draught whatever is the lowest radiant efficiency of the Wright fire less than 7 per cent. higher than the highest radiant efficiency of the Davis fire.
(*b*) Under equal conditions (A and A, B and B, C and C), the radiant efficiency of the Davis fire is from 11 to 23 per cent. lower than the Wright fire.

It being proved that sacrifice of heat units results from Messrs. Davis's construction, the question you hint at, of whether or how far there might be valid reasons for making such a sacrifice, is quite worth discussion on its own merits. But obviously that cannot be discussed so long as the sacrifice of heat units itself continues to be disputed. Let the sacrifice be frankly recognized; and then the question of whether it should be avoided or faced could be discussed.

Meantime, so far as the present controversy is concerned, it is your evident determination to preface every communication from me with a leading article presenting my position from your (*i.e.*, Messrs. Davis's) point of view, and throwing your editorial weight against it, before your readers have got the length of reading what I say. For my part I have said my say, and given my proofs; and, so far as I am concerned, the matter is at an end.

In closing, let me return for a moment to the "original contention," to which mine replied—viz., Messrs. Davis's claim, in your columns of July 30, that "the space between the front edge of the canopy and the refractory mantles is carefully proportioned to allow a large volume of ventilating air to be drawn into the flue without in any way affecting the radiant efficiency of the fire." It is only fair to Messrs. Davis to presume that they did not make a claim so important and far-reaching without having ample proofs already in their possession. Ten months have since elapsed; but they have made no attempt to produce such proofs. They have asked for my proofs of my negative statement; and they have had them. Will they now produce theirs?

NATIONAL INSURANCE ACT (PART II.).

Decisions of the Umpire in Regard to Gas Workers.

IN the notice of the annual report of the Council of the Institution of Gas Engineers which appeared in the "JOURNAL" last week, it was mentioned that it contained a full up-to-date list of the decisions given by the Umpire under the National Insurance Act relating to workmen employed by gas undertakings. As the list will be useful for reference to many of our readers, we reproduce it.

CASES IN WHICH CONTRIBUTIONS ARE PAYABLE.

A 1: Workmen employed in the construction, repair, or decoration of railway waggons, goods vans, brake vans, and cattle vans.

A 19: Workmen described as bricklayers, plumbers, painters, scaffolders, plasterers, and the labourers of each, who are employed by firms of millers, and are engaged wholly or mainly in the work of construction, alteration, repair, decoration, or demolition of buildings.

A 43: Fitters, turners, machinists, smiths, strikers, millwrights, and their helpers and labourers, who are employed in steel, bar, and tinplate works, and engaged wholly or mainly in the maintenance and upkeep of machinery, and are also payable in respect of carpenters, joiners, and masons, and their helpers and labourers who are employed as above, and engaged wholly or mainly in construction, alteration, repair, decoration, or demolition of buildings.

A 54: Workmen described as bricklayers, carpenters, joiners, plumbers, painters, scaffolders, plasterers, and the labourers of each, who are engaged wholly or mainly in the work of construction, alteration, repair, decoration, or demolition of buildings in connection with businesses other than those included under the trades specified in Schedule VI. of the National Insurance Act, 1911.

A 58: Workmen described as smiths and mechanics, and the labourers of each, who are engaged wholly or mainly in the work of maintenance and upkeep of machinery in connection with businesses other than those included under the trades specified in Schedule VI. of the National Insurance Act, 1911.

A 64: (1) Workmen described as wheelwrights who are engaged wholly or mainly in repairing carts and waggons.

A 142: A labourer who is engaged in tarring, lime washing, rough painting, and glazing buildings.

A 178*a*: Workmen engaged wholly or mainly in the work of construction, reconstruction, or alteration of railroads.

A 191: (7) Workmen who are engaged wholly or mainly in laying or constructing water, gas, and electric mains (other than services), the cost of which is usually chargeable to capital account:
(8) Workmen who are engaged wholly or mainly in the work of constructing new railway sidings or lines.

A 275: Workmen employed by a firm of gas engineers and engaged wholly or mainly in the work of—
(1) Fitting and turning parts of engineering steel work used in the manufacture of plant and machinery for gas-works;
(2) Construction and erection of plant and machinery appertaining to gas-works;
(3) Labourers engaged with the above;
(4) Gas-fitters engaged away from the works in installation of gas services in private and public buildings.

A 321: Workmen engaged in the work of building upon the site bridges, gasholders, and tanks, and the preparation of the material for such on the site or in a constructional yard or shop. (See also B 615.)

A 374: Workmen engaged in the construction, reconstruction, or alteration of blast-furnaces, lime and brick kilns, gas-retorts, chemical, and electrolytic plant.

A 407: Workmen employed by a gas company, and described as gas-fitters, who are engaged wholly or mainly in the work of piping customers' houses and repairing for escapes of gas.

A 534: Workmen employed by a firm of gas-engine makers, and described as:
(1) Patternmakers in iron (including steel ndry;
(2) Sheeters;
(3) Workmen repairing steam-boilers;
(4) Boilermakers.

A 548: Workmen, described as gas-fitters, fixing and running gas pipes and fittings to buildings.

A 570: Workmen engaged in the construction, reconstruction, or alteration of coke-ovens or bye-product plant.

A 600: Workmen employed by a town council and described as:
(1) Water-meter repairer;
(2) Gas-fitter, fitting up pipes into customers' premises.

A 856: Workmen engaged wholly or mainly in the installation or in the upkeep and repair of hot water and steam pipes, ventilating systems, or permanent gas-piping in buildings in connection with businesses other than those included under the trades specified in Schedule VI. of the National Insurance Act, 1911.

A 955: Workmen engaged in building up at the works loco. gas machines, and fixing them in buildings, also fixing any necessary gas piping and fittings, and overhauling and repairing existing installations.

A 956: Workmen engaged wholly or mainly in fixing boiling water apparatus and coffee-making machines in restaurants and buildings generally, and in keeping in repair the gas and water fittings after they are fixed.

A 1001: Workmen employed as tool-makers and engaged wholly or mainly in making dies and tools used in the manufacture of lamps and gas and electric light fittings.

A 1025: Workmen engaged wholly or mainly as gas-fitters, doing gas-fitting on stations and signal boxes, &c.

A 1072: Workmen engaged in running gas-pipes from a gas company's services in the basement of a block of tenements to the various rooms in the tenements.

A 1133: Workmen engaged in making and assembling gas-governors.

A 1229: Workmen employed in connection with:
(1) The substitution of vertical for horizontal gas-retorts;
(2) The conversion of gasholder tanks into tar tanks.

A 1254: Workmen engaged in the renewal of lifts of gasholders.

A 1259: Workmen engaged wholly or mainly in the repair or re-building of brick settings, furnace arches, furnace linings, or brick flues in connection with (1) all kinds of steam-boilers; (2) brewery coppers.

A 1284: Workmen engaged wholly or mainly in the manufacture or repair of coal and coke conveyors.

A 1294: Workmen engaged in the alteration of gas-retorts from sloper beds to horizontal beds on old foundations.

A 1315: Workmen engaged wholly or mainly in:
(1) Fixing or repairing or altering gas piping in buildings;
(2) Installing for the first time gas-fittings.

CASES IN WHICH CONTRIBUTIONS ARE NOT PAYABLE.

B 10: Workmen in the service of an electric supply corporation employed as follows:
(4) Testers to test and connect installations and arc lamps series;
(5) Meter readers, to read all meters in consumers' premises.

B 24: Workmen employed by firms of millers who are engaged wholly or mainly in the work of:
(1) Steam, gas, or oil engine drivers;
(2) Stokers or gas plant attendants;
(3) Steam and petrol waggon drivers;
(4) Motor-car drivers.

B 42: Workmen employed by a firm of dyers and described as stillmen who are engaged wholly or mainly in attending to the stills and condensers of the distilling plant, and are not engaged wholly or mainly in the maintenance and upkeep of machinery.

B 50: Workmen employed in a mechanical engineering establishment and described as timekeepers, watchmen, storekeepers, draughtsmen, tracers, gatemen, weighmen, passenger hoist attendants, closet attendants, office attendants, commissionaires, clerks and typists (male and female), office errand boys.

B 52: Workmen engaged in the work of filing, making, polishing, lacquering and putting together electroliers, chandeliers, brackets, and mirror fire screens.

B 53: Workmen described as farriers and farriers' mates, who are engaged wholly or mainly in the work of shoeing horses.

B 65: Workmen employed by a borough council and engaged wholly or mainly in the work of driving a steam motor waggon.

B 67: Workmen described as:
(2) Sign writers who are engaged wholly or mainly in the work of writing signs and writing on office doors, gilding letters, &c.

B 94: A workman employed by a railway company, and described as an engine cleaner engaged solely in engine cleaning, not repairing or fitting, nor having the control of any machinery.

B 97: Workmen employed by an urban district council, and engaged in the work of road repairing, cleansing and watering, sewer cleansing, lamp lighting and extinguishing, night-soil removal and dry ashpit employees, public market attendants, public bath attendants and laundrymen, public park rangers, water and lighting inspector and assistants, sewage farm attendants.

B 99: Workmen employed by a firm of lime burners, and engaged in the work of excavating limestone from quarry, transporting same to open kilns, burning same therein, and transporting same to railway, &c.

B 116: Workmen employed in shipbuilding establishments, and described as timekeepers, watchmen, draughtsmen, tracers, closet and office attendants, commissionaires, clerks, typists, and office errand boys, storekeepers, gatemen, weighmen, passenger hoist attendants, female clerks and typists.

B 144: Workmen employed by a brewery company, and described as:
(1) Drivers, who are engaged wholly or mainly in the work of driving motor waggons;
(2) Engine attendants, who are engaged wholly in the working of engine and boiler.

B 166: Workmen employed by a firm of gas engineers and artistic ironfounders, and described as warehousemen and storekeepers.

B 190: Workmen employed by a local authority, and engaged wholly or mainly in the work of:
(1) Redressing old granite and whin kerbs;
(2) Preparing and repairing square stone bases for the erection of gas-lamps;
(3) Setting up poles to be used solely for gas or electric lamps for street lighting purposes;
(4) Repairing and maintaining overhead, third rail, conduit surface contact, or cable equipment of railroads, tramways, light railways, or electric power supply, the cost of which is usually chargeable to revenue account;
(5) Preparation or repair of removable gas and electric stoves;
(6) Shoeing horses;
(7) Making lamp irons and bolts for erection of lamp-pillars;
(8) Dismantling and assembling gas, water, and electric meters;
(9) Repairing car conductors' punches, automatic gas and electric controllers for lighting and extinguishing lamps.
(10) (*a*) Laying services;
(*b*) Or laying mains, the cost of which is usually chargeable to revenue account;
(11) Repairing railway sidings;
(12) Repainting ironwork which is not part of a building.
(13) Repairing and maintaining roads, streets, and sewers;
(14) Cranemen employed in water and gas departments' depôts and yards;
(15) Jointing cables for the purpose of repairs or taking branches from mains in consumers' premises;
(16) Workmen repairing gas and electric meters;
(17) Brass finishers;
(*a*) Regrinding old taps, and grinding valves of gas-meters;
(*b*) Finishing and assembling cable accessories for underground and for use in consumers' premises.

B 238: Workmen employed by a gas company, and engaged wholly or mainly in the work of:
(1) Fuel handlers, unloading fuel;
(2) Elevator men, working automatic elevators;
(3) Feeding producer men feeding producers, withdrawing and wheeling away ashes;
(4) Washermen, scooping soot;
(5) Tower and tank men, attending to the towers and skimming tar;
(6) Blowermen, oiling and attending roofs, blowers, and pump;
(7) Compressor men, oiling and attending compressors;
(8) Gas-engine men, attending gas-engines and electrical plant;
(9) Stokers;
(10) Meter testers;
(11) Inspectors and assistants, cleaning and distributing apparatus, inspecting and reading meters;
(12) Labourers, cleaning up, &c.;
(13) Sulphate of ammonia men;
(14) Packers of sulphate;
(15) Storekeeper and timekeepers and assistants
(16) Watchmen, cleaners, tarmen.

B 245: Workmen employed at a gas-works and engaged wholly or mainly in:
(1) Drawing and charging gas-retorts and attending furnaces;
(2) Discharging coal from railway trucks, and labour generally;
(3) Inspecting and testing consumers' meters.

B 247: Workmen engaged in fitting up and finishing ready for sale cast-iron gas-cooking apparatus, coal and coke stoves, grates, and gas-stoves.

B 264: Workmen employed by electric supply companies, and described as follows:
Ash cleaners; boys (porterage and general cleaning); coal trimmers, labourers and measurers; condenser attendants; dynamo cleaners; engine drivers; engine cleaners; firemen; foremen; greasers; gate and time-keepers; instrument and meter testers and calibrators; inspectors; loco. drivers; lamp trimmers; labourers (cleaning and generally assisting); lady attendants; regulators (switchboard and battery attendants); store-keepers and assistants; shopboy; shift engineers; sub-station attendants; transformer and dynamo attendants; water softener attendant; water and pump attendants; box inspector; camp boys; chauffeurs; installation inspector; gangers (if not employed wholly or mainly by way of manual labour); street lighting attendants; yard-men; clerks; canvassers and collectors; chefs and mess room attendants; lavatory attendants; carmen; draughts-men; lightermen; lift attendants; office cleaners; typists (male and female); telephone girl; window cleaners; chemists.

B 274: Gas-meter makers, including tinplate workers and those engaged in fitting and turning the internal mechanism (*i.e.*, brass parts) used in the manufacture of these meters.

B 298: Workmen engaged wholly or mainly in the work of pre-paring paving-stones for footpaths and setts for carriage-ways.

B 327: Workmen employed at dye-works, and described as (1) Gas-engine and well pump hands who are engaged wholly or mainly in attending producer plant, and well pump and driving gas-engine.

B 371: Workmen engaged wholly or mainly in the work of making (3) Incandescent gas-burners.

B 373: Workmen engaged in the work of repair of blast-furnaces, lime and brick kilns, gas-retorts, and retort-settings, chemical or electrolytic plant (not being machinery).

B 396: A workman engaged in the work of making and repairing boxes, benches, barrows, &c., and other movable articles used in the manufacture of bricks and tiles.

B 420: Workmen employed in the gas department of a city council, and described as follows:
Turncocks, drillers, drilling holes in gas-lamp pillars; painters, painting gasholders, lamps, and meters; labourers employed at times to test pipes and taps; pressuremen, who take records of the pressure of gas in the mains; tube threaders.

B 472: Workmen engaged in making and repairing steel barrows for ashes.

B 541: Workmen employed at steel works, and described as:
(1) Men working boiler feed pumps;
(2) Boiler firers;
(3) Coal elevator men;
(4) Hydraulic engine men;
(10) Cranemen;
(11) Men at furnaces.

B 547: Workmen described as:
(1) Painters, painting street lamps;
(2) Blacksmiths, making wrought-iron cradles and brackets for lamps;
(3) Brass moulder, casting parts for gas-lamps, &c.;
(4) Brass finisher, finishing small parts for gas appli-ances;
(5) Metal stamper of parts of street lamps.

B 571: Workmen employed in the repair of ovens for the manu-facture of coke and of bye-product plant (other than buildings or machinery).

B 607: Workmen employed by the gas department of a city council, and engaged in fixing and removing (removable) gas-stoves.

B 615: Workmen engaged in making
(2) Small riveted tanks and cisterns, not being made in mechanical engineering establishments (including boilermaking shops), and not being covered by decision A 321.

B 711: Workmen described as gas stokers, employed during most of the year as stokers at a gas-works, and part of the year as labourers in the works and yard, assisting in the overhauling, cleaning, and repairing of plant and apparatus, provided they are not employed wholly or mainly on repairs to buildings or machinery.

B 719: Persons employed in the manufacture of billiard tables, fittings and accessories, including the manufacture ot gas and electric fittings for same, but not including the installation of gas and electric light in billiard rooms.

B 733: Persons engaged wholly or mainly in the manufacture of wooden barrows.

B 779: Workmen engaged in
(*a*) Running services from the main to the consumers' meter;
(*b*) Fixing gas-meters in houses.

B 802: Workmen engaged wholly or mainly in general repairs to removable gas-cookers, gas-fires, gas-fittings other than pipes in customers' houses.

B 865: Workmen engaged in the manufacture of gas-testing apparatus, or in testing and fitting incandescent gas-burners, except in so far as same is covered by decisions relating to ironfounding.

B 951: A workman described as an instrument maker, and en-gaged wholly or mainly in making:
(1) Instruments for testing gas;
(2) Recording instruments for general use in engineer-ing works.

B 957: Workmen described as metal workers, and engaged wholly or mainly:
(1) As brass finishers grinding in gas-cocks for incan-descent lamps, parts for hand fire-extinguishers, &c.
(2) As brass finishers, making patterns for gas and water fittings for use on above.
(3) In putting together gas-fittings into casings for lamps.
(4) In making gas-fittings and parts of hand fire-extinguishers.
(5) In fitting together automatic boiling-water appa-ratus for restaurants, and testing same.
(6) In annealing copper, brass, and German silver spinnings.

B 982: Workmen engaged wholly or mainly in fixing, removing, or repairing portable and removable market stalls, or the temporary gas-fittings attached thereto.

B 1024: Workmen engaged wholly or mainly in the manufacture of portable boilers heated by gas, and used for domestic purposes.

B 1126: Workmen engaged in repairing and fixing automatic gas-controllers for lighting and extinguishing street gas-lamps.

B 1152: Joiners and their labourers engaged wholly or mainly in making sleeper revetments and trestles for supporting gas explosion tubes, and other similar work, and not being engaged wholly or mainly in the construction and repair of buildings.

B 1316: Workmen engaged wholly or mainly in:
(1) Disconnecting or re-connecting gas-cookers, gas-heating appliances, and gas-fittings (not including work on piping covered by decision 1315).
(2) Repairing removable fittings.

Gas Water-Heaters—A Warning.

The Secretary of the British Commercial Gas Association (Mr. W. M. Mason) sends for publication the following letter dealing with the fitting of gas water-heaters, and containing a warning that has often been given in the pages of the "JOURNAL," but which cannot too frequently be urged by gas engineers on the attention of all fitters in their districts:—

"In view of the fact that gas water-heaters of the geyser type are being advertised as 'not requiring a flue,' I am desired by the Executive Committee of this Association to warn all connected with the supply or fitting of gas water-heaters that appliances consuming large quantities of gas in a short time ought never to be fitted in such confined spaces as bath-rooms without an adequate flue for carrying off the products of combustion.

"The recent deplorable fatal accident which was caused through neglect to fit this necessary adjunct to a geyser, emphasizes the necessity for as much care being taken to see that gas consumers are protected against risk in the use of what is, if properly fixed, a perfectly safe as well as most convenient type of apparatus, as has, for example, to be taken to protect consumers of electricity by seeing that the wiring is properly insulated.

"It is to be hoped that the practice of fixing geysers without flues will be entirely discontinued. Anyone guilty of so doing incurs very grave responsibility."

Explosive Mixtures of Coal Dust and Air.—In the course of a lecture on the "Testing of Safety Explosives," lately delivered by Professor Vivian B. Lewes, F.I.C., F.C.S., at the Royal Society of Arts, he dealt with the explosion of mixtures of coal dust and air. He remarked that, in making this mixture, its sensitiveness would depend upon (1) the ease of ignition of the dust, the degree of fineness to which it is reduced, and other factors, one of the most important being its freshness; (2) the percentage of dust to air at the moment the shot is fired into it; (3) the percentage of oxygen in the air. Through the intermediary of Major Cooper-Key, Professor Lewes obtained a sample of the dust made by grinding coal from the 7-foot seam of the Birchenwood Colliery, North Staffordshire, to a powder that would pass a 150-mesh sieve. On analysis, the dust gave: Moisture, 2·40 per cent.; volatile matter, 29·60 per cent.; fixed carbon, 65·41 per cent.; ash, 3·94 per cent.; while its ignition-point was 400° C. He thought it was evident, therefore, that if coal dust were suspended in pure air with a percentage of 20·9 of oxygen, as soon as the temperature was raised for a sufficient length of time to 400° C. the dust would ignite.

BRITISH COMMERCIAL GAS ASSOCIATION.

Report of the Executive Committee.

THE Executive Committee of the British Commercial Gas Association held a meeting last Thursday, at which a long report was submitted for the consideration of the General Committee. The following paragraphs are extracted from it.

DISTRICT REPRESENTATION.

As reported at the last meeting of the General Committee, the additional subscriptions received or promised have entitled a number of the district areas to further representation on the General Committee. Since the appointment of Mr. Hubert Pooley for the Midland and Mr. R. Beynon for the South-Western Districts, special district meetings have been held at which the following gentlemen have been unanimously elected: Manchester, Alderman H. Wilde, J.P. (Oldham); Scotland, Bailie John A. Lindsay (Edinburgh); and Southern, Mr. W. J. Sandeman (Croydon). The election of such experienced and qualified representatives will, it is confidently felt, add to the strength and influence of the General Committee, where they are assured of a most cordial welcome.

ADDITIONAL SUBSCRIBERS.

Propaganda work among non-subscribers has been steadily maintained. The reprint, in collected form, of the Association advertisements which appeared in the month of March gave such concrete evidence of the comprehensiveness of the work that is being done, that it was made the basis for another appeal for support. The response has been gratifying; and the Executive have satisfaction in being able to report that since the last meeting of the General Committee no fewer than fifty, as follows, have been added to our list of subscribers:—

Alnwick
Ashford (Corporation)
Barrhead
Bathgate
Brentwood
Brierley Hill
Cardigan
Coldstream
Daventry
Dronfield
Dudley Town
Halstead
Harpenden
Helensburg (Corporation)
Ironbridge
Kirkham
Mansfield
Market Drayton
Mundesley
Neston and Parkgate
Newent
New Ross
Northampton
Overton, Bangor, and District
Pembroke Docks
Pershore
Portishead
Portrush
Quaker's Yard
Reigate
Romford
St. Anne's-on-the-Sea
St. Margaret's
Shepton Mallet
Shifnal
Staveley
Stone
Stowmarket
Sutton and Hooton
Tavistock
Thornton (Urban Dist. Council)
Twyford
Warrington (Corporation)
Westhoughton
Wimborne
Windermere
Woolton
Wymondham
Wyvenhoe
Yeovil

SPECIAL SUBSCRIPTIONS.

Donations of £1 1s. and £5 5s. respectively have been received from the Isle of Wight Gas Association and Messrs. T. Cash and Co. The total additional annual income represented in this list is £300. This sum it is anticipated will be augmented in future, as some of the new supporters have commenced subscribing on a partial basis, which, as experience has proved, is likely to be increased when more knowledge is gained of the advantages to be derived from membership. That much "missionary" work remains to be done is proved by a list of non-subscribing undertakings of 50 millions and upwards which has been compiled for the information and use of the many members who are using their influence to increase our membership.

POSITION OF URBAN DISTRICT COUNCILS.

As reported at the last meeting, the time had evidently arrived for approaching the Local Government Board regarding the right of urban district councils to subscribe to the funds of the Association. Letters continue to be received stating that, if a favourable decision could be obtained, a very considerable number of district councils would join at once. A hopeful point has to be reported—viz., that the Irish Local Government Board have sanctioned the subscription of £100 voted by the Belfast Corporation. This, it is anticipated, will prove a useful precedent, and give added weight to the arguments used when stating our case. A letter has been addressed by the President of the Association to the President of the Local Government Board on the subject, and it is hoped that the representations laid before the Board will result in sanction being given to subscriptions to the Association by district councils. If necessary, a deputation will be appointed to wait upon Mr. Burns.

ADDITIONAL VICE-PRESIDENTS.

Taking into consideration the gratifying increase in the membership and income of the Association, the Executive consider it fitting to make additions to the list of Vice-Presidents; and the following are therefore recommended for election—all those nominated having taken a keen practical interest in the work of the Association:

Alderman W. Armitage, J.P. (Doncaster).
Alderman W. Craig (Belfast).
George G. Gray, Esq., J.P., LL.D. (Hastings).
G. Hardy Harris, Esq. (Exeter).
Bailie John A. Lindsay, J.P. (Edinburgh).
Alderman J. M'Gaul, J.P. (Birkenhead).
Reginald J. Neville Neville, Esq., J.P., M.P. (Brentford).
Bailie Thomas Paxton, J.P. (Glasgow).
Alderman W. Penrose Green, J.P. (Leeds).
Alderman T. Smith, J.P. (Leicester).
Alderman David Wade, J.P. (Bradford).

ASSOCIATE AND INTERNATIONAL MEMBERS.

The following are submitted as candidates for election:

Associate Members.—Miss E. M. Ashton (Birmingham), W. Kings (Birmingham), H. W. Price (Birmingham), C. R. Wheaton (Bath).

International Members.—G. S. Barrows (Philadelphia), A. P. Brill (Pittsburg), R. W. Ford (Vancouver), Dr. H. B. Harrop (Rio de Janeiro), R. R. Young (New Jersey).

GEYSERS WITHOUT FLUES.

Strong representations have been made without effect to a firm advertising flueless geysers, and the Executive propose to issue a letter to all the trade papers calling attention to the grave responsibility incurred by anyone fixing a geyser in a bath-room without a proper flue. [see p. 727.]

ASSOCIATED ARCHITECTS.

A number of subscribers have asked and received advice regarding the design and arrangement of their show-rooms; and the service rendered in this respect seems to have been keenly appreciated. Advice has also been asked as to the preparation of plans; and the Executive therefore consider it would be a good service to the industry if a reliable firm of qualified architects could be officially appointed as Consulting Architects to the Association. Messrs. Septimus Warwick, F.R.I.B.A., and Austen Hall, F.R.I.B.A., have acted in this capacity in connection with the National Gas Exhibition, and have shown so much enthusiasm and initiative in their work that it was felt that, with the knowledge and experience they had thereby secured, and would secure, no more suitable firm could be selected. The Executive have therefore appointed this firm as Consulting Architects to the Association.

OFFICE RECORD.

The Committee will be interested in knowing that a remarkable number of inquiries were received in response to the spring advertising campaign. The total number dealt with in ten months up to the 12th of February was 4646; but in exactly two months from that date a further 2605 were received. This, in addition to very heavy correspondence and general work, has materially increased the work of the office staff. As an indication of the volume of work passing through the office, it is interesting to record the fact that over £60 was required for postage during the months of March and April.

ASSISTANCE RENDERED.

The Association continues in an increasing degree to be used as a central inquiry agency—assistance being asked and rendered in a great variety of ways. It is gratifying to report that more and more the industry and the public are recognizing that the Association stands for willing and ready service, and can be depended upon for prompt and valuable assistance.

Expressions of appreciation are being continually received, which clearly indicate that managers are finding the work done of much practical benefit in their local efforts. The general public evidently look on the Association as an unbiassed, independent authority which can be relied upon to give a true statement of facts relating to gas and independent advice on the subject. This "central independent authority" impression is invaluable from the publicity point of view.

(Signed) F. W. GOODENOUGH, Chairman.

More Dessau Vertical Retorts for Melbourne.

Mr. C. Holmes Hunt, the Secretary of the Vertical Gas-Retort Syndicate, Limited, of Victoria Street, Westminster, writes to say that they have recently received from the Metropolitan Gas Company of Melbourne (through their agents, Messrs. John Terry and Co.) a further order for an installation comprising five beds of eighteen five-metre Dessau vertical retorts—1912 type. This installation will be a further extension of the existing Dessau vertical-retort plant at the Company's South Melbourne works, bringing the total carbonizing capacity of the whole plant to upwards of three million cubic feet per diem.

LONDON AND SOUTHERN JUNIOR GAS ASSOCIATION.

Visit to Hastings and Its Gas-Works.

A busy day—and a day that will long be looked back upon with pleasure—was spent in Hastings on Saturday by members of the London and Southern District Junior Gas Association. Undeterred by exceedingly unpromising weather prospects, members and ladies to the number of over fifty assembled at Cox's Restaurant, in Queen's Road, about noon, for lunch; and by the time this was over, it had become evident that their courage in leaving home would be well rewarded, for the rain had cleared off, and the sun was making its appearance. In fact, for the remainder of the day Hastings was, perhaps, seen under the very best conditions—breeze and sunshine.

When lunch was over, special cars conveyed the party to the works of the Hastings and St. Leonards Gas Company at Glyne Gap—a ride of about four miles along the sea front towards Bexhill. Here they were taken charge of by Mr. C. E. Botley (the Engineer and General Manager), Mr. C. F. Botley (Assistant Engineer), and Mr. F. J. Winter (Junior Assistant); while Mrs. C. F. Botley looked after the ladies, and Miss Botley also helped to make the visitors acquainted with the works. There are, of course, many features about the Glyne Gap station; for the conditions that had to be met called, in various respects, for special treatment. The works are really new—having been erected no more than about nine years ago; and readers may be referred to the illustrated articles dealing with them which appeared in the "JOURNAL" during 1903 [Vol. LXXXII.]. Of all the features noted, it will probably be safe to say the one which some of the visitors most envied is the beautiful open position of the works—with the sea on one side and the downs on the other.

By the year 1898, the original works of the Company, which were situated in Queen's Road, had become congested, and unequal to the rapidly increasing demand for gas, especially in regard to purification, and, in addition, the retort-houses were unsuitable for machinery or for converting to the stage-floor type, and coal-handling was expensive. It was under these conditions that Mr. Botley advised the Directors to promote the Bill under which the Company secured power to establish the new works on a site of 20 acres at Glyne Gap. The general design of the works is for four sections—up to 8 million cubic feet per day total capacity—two sections being at present erected.

In their inspection, the party were taken through the works in such a way that the processes were seen in proper sequence—beginning with the coal-handling arrangements. The coal used on the works, Mr. C. F. Botley explained, comes from the Tyne and elsewhere to Newhaven Harbour, and is taken by rail from there, for which purpose the Company own some sixty waggons; the traffic being kept as regular as possible, so as to avoid the expense of putting coal into and out of stock. Something like a mile of sidings are available; and these are connected at one end, in lieu of crossings, with a rather unique contrivance in the form of a traverser weighbridge, which also serves to connect the overhead line in the coal-stores and the 20-ton turntable hydraulic lift. As the coal-trucks are of various types, provision had to be made for emptying them. The coal is discharged on to an electrically-driven rubber belt conveyor, which has already dealt with something like 200,000 tons of coal. The third belt having just been put into use, this gives a working capacity of about 100,000 tons of coal to each belt. On the high-level sidings already referred to oil is received and tar dispatched; and there is a crane with a Hone grab, in order to deal with large and broken coke, breeze, coal, &c.

The retort-house has the usual stage-floor, with an elliptical iron roof; the brickwork above the springing line being of the skeleton type. The stoking machinery consists of a West combined machine, operated by compressed air, on either side of the house; while on the south side only there is a De Brouwer electrically driven charger, and an Arrol-Foulis hydraulic machine for discharging. There are overhead coal-bunkers throughout the house, of a total capacity of 400 tons. The coal is elevated from the breakers by inclined and horizontal conveyors; the motive power being electrical. In each of the two retort-benches there are nine beds of eight 20 feet through, 22 in. by 16 in., oval ⌀ retorts. So far, only one regenerator has been rebuilt; but the retorts have all been reset once, and in some cases twice—some having had 1300 days' work. As to tar-towers, the present arrangement is one tower to each bench; but steps are being taken to alter this, by having at least two towers to each bench. In spite of the fact that dip-pipes were all put in and levelled to a water-line, and that the hydraulic mains are independently supported from the beds, there is the difficulty of not being able to keep each one alike; and therefore some special subdivision of the beds in relation to the towers is considered advisable.

The coke when drawn falls through the floor into specially designed steel bogey trams of 160 cubic feet capacity. There it is partly quenched, seeing that water must be employed to keep the skips somewhat cool. It is possible for a man to work a tram along as the drawing proceeds, and when full to run it to the end of the house—it being then drawn out by rope haulage on an electric or hydraulic capstan. As originally designed for six-hour charges, the make of gas per mouthpiece was set at 7000 cubic feet; whereas in the present half year, during which eight hour charges of 9 cwt. each are being worked, the make per mouthpiece has reached 9000 cubic feet.

The gas leaves the retort-house by two 18-inch mains—one from each bench—and goes to the condensing plant. This is specially arranged, and is of the Clapham water-tube type, reversible, in two sections, with a bottom tank and an overhead tank. The bottom tank has divisions so as to handle tar and liquor; and overhead is a liquor tank—the liquor being pumped up from below, and serving the retort-house and preliminary purification plant. Tar from the retort-house and elsewhere is all sent into this condenser tank and then pumped up to the tar tank, on the siding, and loaded therefrom into the railway travelling tanks for the chemical works. The 24-inch main from the condenser is carried in a culvert (which also accommodates many other pipes, electric cables, &c.) to the machinery-house, where the exhausters are located. This main is also used for the return of some tar from the tar-extracting apparatus adjacent to the exhausters; and the plan is stated to have worked very well, for at no time when the main has been opened has any accumulation been found in it.

A good deal of time was spent in the fine machinery-house, for there was much of interest to be seen here. Over the house a splendid room is being fitted up for recreation and other purposes; while over the boiler-house there is a cast-iron water-tank having a capacity of 90,000 gallons. To return to the machinery or power house, the pipe-alley is a distinctive feature; and in the house there is the following plant: Two twin 60,000 cubic feet per hour exhausters for coal gas, pumping through to Hastings. Two single-line air-compressors for the retort-house machines. A Davey-Paxman Westinghouse electrical set. A Westinghouse gas-driven electrical set, which is nearly always in use, and has already run over 50,000 hours. A steam compound hydraulic pumping engine; and a motor-driven air compressor for drainage. A small gas-driven air-compressor, in connection with the Westinghouse gas-engine. Two Tangye-Archer vertical steam-engines driving the blowers. A steam-driven gas-compressor for the oil-gas carburettors; and a 100,000 cubic feet per hour exhauster for oil gas, driving a small air compressor in connection with the purification. Space, too, is still available for another set of exhausters and some further gas-driven electrical plant. The boiler-house is well equipped; and between the two sections is a pump-room. Liquor concentrating plant is temporarily accommodated in a portion of the boiler-house; this method of treatment being a great convenience, under the peculiar circumstances of the works. The liquor is concentrated as produced, and sent away from time to time in travelling tanks to the chemical works; a pipe-line being laid to the siding. Outside there is a weak liquor storage tank, and a storage tank for strong liquor of about 80 oz. The effluent from the plant, which is quite free from objection, is sent to a settling and cooling pit.

The mechanical or liquid purification plant comprises a Pelouze and Audouin tar-extractor, a Walker purifying machine, a Kirkham, Hulett, and Chandler "Standard" washer, and a Holmes scrubber-washer. The mechanical power necessary for this plant is provided by an old simple horizontal steam-engine, the exhaust of which passes into the same pipe system as serves the machinery-house—being utilized in winter in connection with the purifier-house heating. The purifier-house is 100 yards long, and contains seven coal-gas purifiers and six for oil gas. An up-and-down hydraulic lift is placed in a central position, which enables trams to be employed in moving material from the floor on to the stage; and the oxide and lime can be brought in full truck-loads to the foot of the lift. The coal-gas purifiers consist of a cast-iron box, 280 feet long and 5 feet deep, divided into seven compartments, each fitted with two lids covering together an area of 40 feet by 32 feet. The covers are very light and of original design, and when removed leave the whole area free from obstruction. The joint is made with india-rubber; and the boxes are at present charged with oxide, each containing roughly 90 tons of material. All the purifiers are conveniently charged from the top and discharged on to the top floor or through the bottom into trams, or the coal-gas purifiers can be discharged through side-doors into railway-trucks. A 100,000 cubic feet per hour rotary meter is installed for the coal gas, and an 80,000 cubic feet per hour ordinary station meter for the oil gas; the connections being so arranged that the gas from the rotary meter can be passed through the station meter. The two streams of gas meet in the trunk main, which is practically 4 miles long. At the Hastings end, a pair of 80,000 cubic feet per hour exhausters are installed; and these are brought into use when the hourly make of gas is maintained at over 85,000 cubic feet.

The oil-gas plant was originally erected at Hastings, but was remodelled and removed to Glyne Gap. A spare generator is applicable to either the No. 1 or No. 2 set (each of a capacity of 600,000 cubic feet per diem); and this enables the whole of the plant to be made use of without a large amount of stand-by. The carburetting arrangements are special, and were fully explained by Mr. Botley, who had had a sample of the apparatus that is used fitted up and in working order. The oil is put in in the form of mist, produced in the same way as is done in connection with the naphthalene process. This is found to be a great advantage. Coke can be supplied to the generators in a variety of ways; but

experience has shown the most satisfactory to be by dealing with the coke cold, and storing it into the hopper, which is provided with a screen—the operator loading it into the charging-buggies as required. The lift has a turntable and weighbridge, so that the skips of coke can be weighed up and empties down, and an accurate record kept. The building is a steel-frame structure, with skeleton brickwork, for the most part only 4½ inches thick; and there is ample room for extension. Owing, again, to special circumstances, the oil storage is in six cylindrical vessels, each of 10,000 gallons nominal capacity.

Railways as well as tramways are being extended to serve all parts of the works; and on the north boundary, a commencement has been made with residences for the men. There are excellent workshops, by means of which the Company are enabled to do their own repair work. As a matter of fact, the works themselves were built to a large extent by the direct employment of labour. Below the men's lobbies, and also underneath the coal-stores, with a capacity of 250,000 gallons, are water-tanks; the water used for quenching, condensing, &c., being returned into a settling tank, from which it overflows into the storage tank. An electrically-driven centrifugal pump raises this water to the overhead tank.

The inspection completed, the party were brought back to the town by the special tramcars, and proceeded to the distributing station, where they were photographed, and then entertained at tea by the Directors of the Gas Company. After tea,

The PRESIDENT (Mr. S. A. Carpenter, of the North Middlesex Gas Company) remarked, on behalf of the Council, that they were pleased to see so many ladies present. All would be agreed that they had had a most pleasant day; and their very best thanks were due to Mr. Botley for looking after them in the way he had done. Previous to the erection of the works they had just inspected, gas was manufactured on the site where they were now assembled. As they saw, it was a very confined area, in a residential part of the town; so that its disadvantages from a gas-making point of view, and with a rapidly growing consumption, were obvious. Finding a new suitable site was a serious undertaking; but Mr. Botley did find one, and an excellent idea of the work which had been carried out on it would be found in a series of articles which appeared in the "JOURNAL OF GAS LIGHTING" about ten years ago. To mention one thing, the system of handling the coal-trucks was a method which he thought they, as an Association, had never seen in any other works which they had visited.

Mr. D. J. WINSLOW (the immediate Past-President) proposed a very hearty vote of thanks to the Directors of the Company, and to Mr. C. E. Botley, Mr. C. F. Botley, and Mrs. Botley for the great kindness they had shown the Association. They had enjoyed the privilege of inspecting a works which embraced many unique features. The Engineer and the Directors of the Company were to be congratulated on the vast progress made. Gas was now being sold at 2s. 10½d. per 1000 cubic feet; and it said a great deal for the management of the Company that the charge was so moderate, when they considered the effect of the cost of the new works on the capital account, and the fact that they had been only nine years in existence. Many interesting points about the works showed inventive genius on the part of those responsible for them. Of course, they were all aware of the naphthalene process known as the Botley process. It was almost ancient history now; but it was, he believed, one of the pioneer remedies, if not the pioneer one, for naphthalene troubles. The same principle was being used in connection with the carburetted water-gas plant; an ideal "fog" being formed by this means. They were greatly indebted to all those—including Mr. Winter—who had looked after them so well.

Mr. ERNEST SCEARS (the Junior Vice-President and Hon. Secretary), in seconding the proposition, remarked that Mr. Botley had put his whole heart into the programme. He was determined to make the day a success, and had amply achieved his object. The Association did not often have ladies with them; and it was not always that they could find works clean enough to take them round. They had, however, at Glyne Gap found an ideal works for this purpose. Thoughts of Hastings naturally brought their minds to the naphthalene problem. Very great credit was due to Mr. Botley and his son for the work they did for the gas industry in connection with this matter. It was they who had originated the idea of using petroleum for this purpose; and the complete success that had attended their efforts was a matter for hearty congratulation. It was the foundation upon which all the other processes seemed to have been built up.

The vote having been accorded by acclamation,

Mr. C. E. BOTLEY said he would not keep them long, but would just like to express the great pleasure he had in meeting them all. Anything he and his assistants had done had been a work of love. He felt it was the right thing to do. It occurred to him how pleasant it must be for those who were growing up in the gas profession to find they had such different facilities for going over works and acquiring information from that which existed when he himself was a boy. They were, he was convinced, only doing their duty to the gas industry by affording every facility to members of the Association to come down and see what they had to show them. His Board had supported him in connection with all the things they had seen that day. They had been progressive, and had joined him in doing everything possible to advance matters. The works at Glyne Gap were different from most other gas-works. They had been designed to meet the special conditions of this particular case. These special conditions had necessitated an entirely new departure being made in regard to the coal supply and the getting rid of residuals, &c. Remarks had been made about the Hastings naphthalene process. Only those who had had experience of naphthalene troubles could have any idea of the difficulties experienced in Hastings some years ago. Naphthalene became a perfect bug-bear to them, and they had to find a way of getting rid of the trouble. Most pioneers did not get much congratulation when they made a new departure; but it would be found that all the processes now used for eliminating naphthalene were based on this. There were about thirty installations in other parts of the country where their process proved equally as satisfactory as at Hastings. In conclusion, he said that those connected with the Company were glad the Association had enjoyed the visit, and hoped the results of it might be of advantage to the members in the future.

Mr. C. F. BOTLEY added that they hoped the members would have pleasant recollections of Hastings and of the Gas Company.

The Company had still various interesting things to show the visitors, who on rising from the tables divided themselves up into small parties. The distributing station (including the "Hastings" naphthalene process) and the compressor station, from which a number of the high-power lamps in the town are supplied, were inspected, as well as the different well-appointed show-rooms. The original naphthalene apparatus was seen, installed on the outlet of the works governor; and it was gathered that perfect success has attended its use, and that the apparatus at the present time only needs about 3 gallons of petroleum oil per day. There are several separate high-pressure installations in the town, and notably one on Hastings Pier. On the St. Leonard's Palace Pier, too, the electric current required is generated by gas-engines.

The party returned to London by a late train, all delighted with what they had seen and done.

ILLUMINATING ENGINEERING SOCIETY.

The Annual Meeting of the Society was held last Tuesday—Mr. F. W. GOODENOUGH, the Chairman of the Council, presiding.

ADVANCING THE AIM OF ILLUMINATING ENGINEERING.

Succeeding some formal business,

The HON. SECRETARY (Mr. Leon Gaster) gave a *résumé* of the report of the Council, dealing with progress during the session. The work of the year has gone further in consolidating the interests and advancing the aims of illuminating engineering. The formation of the German Illuminating Engineering Society (with behind it the support of the Reichsanstalt) is an important step in this direction; and the ground is being well prepared for future international co-operation. In regard to the British Society, additional influential men, both at home and abroad, have joined it; and the membership now exceeds 400. The proportions in which the various interests are represented are shown by the following figures: Electrical engineers and members concerned mainly with electric lighting, 35 per cent; gas engineers, manufacturers of gas appliances, &c., 19 per cent.; professors of physics, engineering experts in photometry, &c., 12 per cent.; air-gas lighting, &c., 7 per cent.; petrol, representatives of oil, acetylene, physicians, oculists, opticians, &c., 9 per cent.; architects, surveyors, &c., 5 per cent.; miscellaneous—public lighting superintendents, mechanical engineers, makers of shades and reflectors, and others not exclusively connected with any one system of lighting—13 per cent. The Council express the view that fuller representation of the gas industry is desirable, and hope that the marked development of interest in the illuminating engineering side of gas lighting will lead to further members being secured. It is also announced that the Council have nominated Dr. R. T. Glazebrook, Director of the National Physical Laboratory, a Vice-President of the Society.

TECHNICAL AND EDUCATIONAL WORK.

A review of the technical work of the year is next given in the report; reference being made to Mr. W. J. Liberty's lecture on "The Centenary of Gas Lighting, and Its Historical Development," and to Mr. A. P. Trotter's paper on "Standard Clauses for Inclusion in a Specification of Street Lighting." It is hoped that the discussion before the Society will result in means being found for suggesting an acceptable basis of agreement. In other directions, such as at the Optical Convention, and at the Society of Arts, subjects bearing upon those in which the members of the Society are concerned have been discussed. The demand for information on the question of scientific illumination, and the extension of the recognition of the necessity for scientific illumination, is shown by the success of the course of lectures at the Regent Street Polytechnic in two succeeding sessions. The Joint Committees on School and Library Lighting have been continuing their labours. In each case it has been agreed that more detailed and exhaustive inquiries are needed on some of the points under consideration. The Committees, therefore, propose to issue interim reports in which the main points already agreed upon are stated in general terms. They will continue in existence with a view to presenting subsequently more detailed information, and will continue to act as a permanent centre of information on these subjects. Mention is also made of the reprinting of the booklet, entitled "Light and Illumination: Their Use and Misuse," with illustrations suitable to both gas and electricity. While referring to this, Mr. Gaster incidentally remarked upon the large amount of useful literature treating of the subject that has been prepared by the British Commercial Gas Association. The Council of the Society also point out that illumination is to be a special feature at the National Gas Exhibition to be held at Shepherd's Bush during the present year. The assistance of the Illuminating Engineering Society has been invited; and it is hoped by the Council to make full use of this occasion to interest the public in illumination, and to provide practical examples of good lighting.

Industrial Illumination.

Readers are aware that the Home Secretary has appointed a Committee to consider this subject, and that the Council of the Institution of Gas Engineers have acquiesced in an invitation to give evidence before the Committee. To refresh the memories of readers on the subject of what is happening in regard to this important matter, we may quote the part of the report of the Council of the Illuminating Engineering Society bearing upon it:

In the annual report for 1911, special reference was made to the important step taken by the French Committee in appointing a Committee on the "Hygienic Aspects of Illumination;" and the hope was expressed that a similar Committee would be established in this country. During the past year a Committee has been appointed by the Home Secretary, and is actively at work. Its functions are:

> To inquire and report as to the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the eyesight of the persons employed, and the various forms of illumination.

The members of the Committee are: Dr. R. T. Glazebrook, C.B., F.R.S., Director of the National Physical Laboratory (Chairman), Mr. Leon Gaster, Professor Francis Gotch, D.Sc., F.R.S., Mr. J. Herbert Parsons, M.B., D.Sc., F.R.C.S., Mr. W. C. Whetham, F.R.S., and Sir Arthur Whitelegge, K.C.B., Chief Inspector of Factories. The Secretaries of the Commission are: Mr. D. R. Wilson, one of H.M. Inspectors of Factories, and Mr. C. C. Paterson, of the National Physical Laboratory.

The report of H.M. Chief Inspector of Factories for 1911 contained a most interesting section devoted entirely to industrial lighting, and occupying 38 pages (about 12 per cent. of the total space of the report). The chief feature of this section is the exhaustive series of tests of illumination by Mr. D. R. Wilson—over 2500 measurements of illumination, made in 125 different factories.

Meantime, other countries have been active. In the United States the New York Factory Commission has adopted an amendment of the existing Act relating to factories, and a series of recommendations has been inserted requiring good illumination in general terms. The Act is to take effect on Oct. 1, 1913. The Académie Royale de Médicine in Belgium has likewise taken up the matter. An important communication was put forward by Dr. Motais, the Secretary of the French Commission on Illumination, at a meeting on Dec. 7, 1912. In recapitulating the circumstances leading to the formation of the Committee in France, Dr. Motais laid stress on the desirability of creating a similar Committee in Belgium. The following resolution was put to the vote and and carried unanimously: "That the Academie de Médicine, having heard the views of Professor Motais (Angers), speaking in the name of the Committee on Natural and Artificial Illumination in France, in his capacity as General Secretary of this Committee, expressed the desire that the Belgian Government should follow the example of the French Government, and several other foreign Governments, and nominate an official Committee charged with the study of questions bearing on natural and artificial illumination and the hygiene of vision."

It may be hoped that Committees dealing with industrial lighting will ultimately be formed in all the chief European countries. Co-operation between these Committees would be desirable, so that they may be in a position to present definite proposals at an International Congress on Illumination. In this way, general recommendations on lighting, applicable all the world over, might gradually be evolved.

It was mentioned by Mr. Gaster that the French and British Committees were going to co-operate in their work.

A Self-Supporting Organization Wanted.

An important matter is dealt with in the concluding part of the report. It is more than a domestic matter, as the efficiency of the work of the Society depends largely upon it. The balance-sheet, showing the income and expenditure during 1912, indicates that a distinct improvement has taken place over the previous year. The Society has again been able to carry out a considerable amount of useful work, and yet to keep its expenditure within bounds. The arrangement by which "The Illuminating Engineer" acts as the official organ enables the Society to publish its transactions, the cost of which would otherwise be prohibitive. The Society has also been fortunate in not being called upon to meet many customary expenses—such as rent of offices, secretary's salary, &c.; and its officers, in an honorary capacity, have ungrudgingly devoted much time to its affairs. At the same time the growing activities of the Society make the present arrangement somewhat burdensome; and its future work may be hampered unless more ample funds can be placed at its disposal. A substantial increase in the membership is still necessary, in order that the Society may be entirely self-supporting with its present moderate subscription; and the Council desire to emphasize the importance of securing additional members. The Society has now a record of valuable work behind it; and its usefulness is beyond dispute. It has therefore a right to expect that those who benefit by the movement will give their aid, and enable it to extend its present sphere of work.

Mr. Frank Bailey moved the adoption of the report. He remarked that it was most satisfactory to the members of the Society to see the position it now occupied; and they had great hope that the future would witness a large extension of its utility. He should like to refer to one point in the report. It was this: "The Society has been fortunate in not being called upon to meet many customary expenses—such as rent of offices, secretary's salary, &c.; and its officers, in an honorary capacity, have ungrudgingly devoted much time to its affairs." They all knew how well the Society had done its work; and they now saw how cheaply it had been carried on.

Mr. R. J. Wallis-Jones seconded the motion, which was unanimously agreed to.

Votes of Thanks.

Mr. W. C. Clinton (London) moved a vote of thanks to the Council and officers of the Society.

Mr. J. G. Clark (Gaslight and Coke Company), in seconding, remarked that light was of real national and social importance; and therefore the value of the Society was very obvious. What had been so far done was largely due to the Council.

Mr. Goodenough, as Chairman, and on behalf, of the Council, acknowledged the vote. In doing so, he said he desired to associate himself with the valuable services rendered by Mr. Gaster and Mr. Dow. They deserved the thanks of the Council, as well as of the members.

Mr. Gaster also replied, observing that, if the Council had not been a pleasant body with which to work, the labours of the honorary officers would not have been so easy.

Mr. John Darch proposed a vote of thanks to the Hon. Auditors (Mr. V. Mackinney and Mr. J. G. Clark). In doing so, he took the opportunity of commenting upon the number of outstanding subscriptions.

Mr. Haydn Harrison seconded the motion; and it was cordially passed.

Moved by the Chairman, and seconded by Mr. Haydn Harrison, the members recorded their hearty thanks to the Royal Society of Arts for the loan of their rooms for the meetings, and for the valuable encouragement the Society had given them.

Mr. Wallis-Jones moved a sincere vote of thanks to the Chairman of the Council. Mr. Goodenough was one of the best examples of which he knew of the busiest man having most time. They were indebted to him for the courteous and able way in which he conducted their business.

Mr. O. P. Macfarlane, in seconding, said Mr. Goodenough was quite was an asset to the Society, and at their meetings he gave general satisfaction.

The Chairman briefly replied; and announced that this concluded the business until the autumn.

THE JAEGER METHOD OF GAS ANALYSIS.

Modification of the Process.

This was the subject of an article by Mr. S. H. Worrell, in a recent number of "Metallurgical and Chemical Engineering," and reproduced in the "American Gaslight Journal" for the 26th ult.

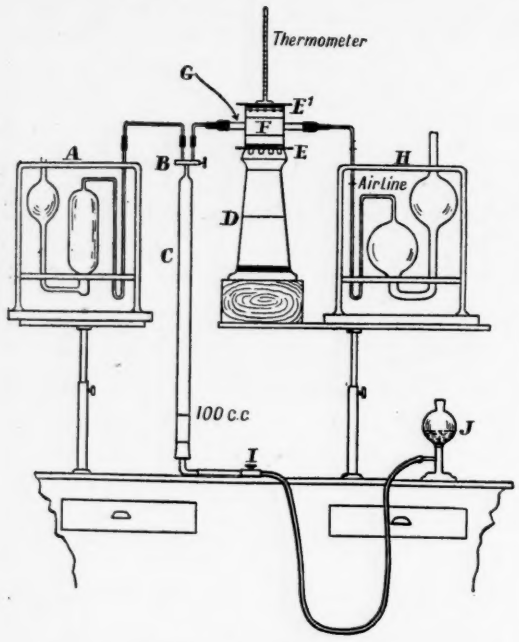
In his introductory remarks the author points out that in gas analysis the absorption of carbon dioxide with potassium hydrate is a simple matter, but that the absorption of carbon monoxide with cuprous chloride, and of hydrogen with the palladium tube, is sometimes less successful. The last-named process was never very satisfactory in the work of the laboratory with which the author is connected; and burning both the hydrogen and methane together was resorted to for a time—the loss in volume being hydrogen, which, when burnt, condensed to water. This method, however, was open to the objection that there was no check on the carbon monoxide absorption with cuprous chloride; for, if any was present, it was burnt to carbon dioxide, and was absorbed and measured with that due to methane. Furthermore, if there was any ethane, it increased the residue in volume when burnt, and thus decreased the apparent percentage of hydrogen. With the Jaeger method, the hydrogen is first removed; and then, when the residue from the hydrogen is burnt, the increase, if any, in volume is due to ethane. In this way, the ethane can be readily determined. After these introductory remarks, the author proceeds as follows.

In using the Jaeger method a pipette containing water slightly acid with sulphuric acid was always employed instead of potassium hydrate as he directs. It was soon observed, however, that the residue left after burning-out the hydrogen at 250° C. frequently contained a small quantity of carbon dioxide. At first, it was thought that this was due to a partial combustion of methane, caused, perhaps, by its reaction with a small quantity of copper oxide dust that might be present. However, prolonged heating at 250° C. and repeatedly passing the gas did not cause the formation of more carbon dioxide. As a matter of fact, this when present was due to the burning of the small residue of carbon monoxide which had not been absorbed with the cuprous chloride, either through lack of thorough shaking or from the solution being too weak.

As a result of this observation, the cuprous chloride pipette has now been entirely discarded; and after removing the oxygen with stick phosphorus, the procedure is simply to burn the hydrogen to water and the total of the carbon monoxide to carbon dioxide in one operation at a temperature of 250° C. The loss in volume is the percentage of hydrogen present. The carbon dioxide formed is absorbed by potassium hydrate, and the loss in volume is the carbon monoxide that was present. The copper oxide is then heated to redness, and the residual gas passed. The volume of gas is noted before and after burning. If there is an increase in volume, it is due to ethane; and one-half of the increase is the percentage of ethane present. The total carbon dioxide formed is then absorbed, and the residue noted. The loss in volume—

accounting for the ethane first—is the percentage of methane present; and the residue is the percentage of nitrogen direct.

For details of the method reference is made to the accompanying diagram, in which A is a semi-permanently attached potassium hydrate pipette (500 grammes to the litre); B, a two-way stopcock; C, a gas burette; D, a Craddock burner; E, a solid asbestos board, 1-16th inch thick; E^1, a similar board with a hole for a thermometer; F, a 4-inch asbestos air bath; G, a silica tube, ¾-inch bore and 7 inches long; H, a pipette filled with water slightly acidified with sulphuric acid; I, a one-way stopcock; J, a levelling bulb filled with 1 to 2 per cent. of sulphuric acid. All glass connections are of capillary tubing, and the rubber should be thick-walled and tight-fitting.



The solution of potassium hydrate in A having previously been drawn over nearly to B, the stopcock is closed to A and opened to the air. Before the portion of the apparatus shown from D to H is placed in position, the burette is filled with gas to be analyzed until the water sinks about an inch below the 100 c.c. mark. The stopcock B is then closed, and the levelling bulb J raised until the gas under pressure has a volume of 100 c.c. The stopcock I is then closed and B opened, bringing the gas to atmospheric pressure and exactly 100 c.c. The gas is then passed into A, where the carbon dioxide is removed. The water in the burette is now caused to flow out to the air until the entire system, including the connection of capillary tubing, is filled with water. The bromine pipette, containing water saturated with bromine, to which a few crystals of bromide of potassium have been added, is then attached on the right. The gas, returned from A to C, and backwards and forwards a few times if necessary, is measured by bringing the liquid in the levelling bulb to a level with the water in the burette. The stopcock I is closed, and the burette is read. The loss in volume is the percentage of carbon dioxide present.

The gas is then passed backwards and forwards from C to the bromine pipette until bromine fumes are distinctly visible in the gas on returning to C. It is then passed into A to remove these fumes, and upon being brought back to C is measured. The loss in volume is the percentage of "illuminants" (unsaturated carbon compounds) that were present. The phosphorus bulb is substituted for the bromine bulb, and the oxygen determined by loss in volume.

The apparatus as shown in the illustration is then placed in position. Care must be taken to have the right-hand opening of the two-way stopcock and the capillary tube leading from it entirely free of potassium hydrate solution. In fact, not a drop of it must enter the burette if it is possible to avoid it, for the reason that one drop can absorb many times its volume of carbon dioxide, causing an error in the hydrogen determination. If any potassium hydrate has entered, the gas should be passed into A after the oxygen is determined, and the passage to the air be thoroughly washed with the acid solution in C and J, until all the potassium hydrate is removed or neutralized.

The apparatus having been placed in position as shown, the air line on the capillary tube of H is noted. With a little care, it can always be brought to the same place. The burner is then lighted and turned down until the bottom of the board E glows in one spot in the centre from 1 to 2 inches in width. This will generally be found sufficient to bring the air in the bath to 250° C, which is the required temperature. The silica tube is filled in its central portion, about 4 inches, with copper oxide, "wire form," crushed until it will pass a 20-mesh screen; and none passing, an 80-mesh screen should be placed in the tube, since it clogs the passage of the gas. The remainder of the tube is filled with an asbestos fibre plug, about half-an-inch on each side of the oxide, and then glass wool to each end. The wool is not necessary, except to make the air content smaller, and to retard the passage of water if any should by accident enter the tube. Care should be taken not to pack the copper oxide, or it will expand on heating and crack the tube. On the other hand, it should fill the tube entirely, to avoid an empty passage along the top.

The temperature of the air bath being from 250° to 260° C., as shown by the thermometer, the levelling bulb is placed on a shelf above the level of F, and the cock I opened slightly to allow the gas to pass slowly through G. It must be passed backwards and forwards until it no longer loses in volume—about six to eight times. The light being extinguished, and the board E^1 removed, the apparatus soon cools to the temperature of the room. Then the gas is returned entirely to C, until the water rises in the capillary tube of H to the former air line. The cock is then closed, and the loss in volume noted. This loss is the hydrogen present in the gas *plus* the oxygen of the air in the silica tube. All this oxygen has, of course, been used up. This volume of oxygen has to be subtracted from the loss in volume due to the hydrogen burning, and the difference is the percentage of hydrogen in the gas. The residual gas is then passed into bulb A, and the carbon dioxide formed by the combustion of the carbon monoxide while heating to 250° C. is measured directly by absorption. To accomplish this thoroughly, the residue in C, after having been deprived of its carbon dioxide content, is again passed through the silica tube, which, of course, contains carbon dioxide, and then the whole is again passed into A. By repeating this fractional removal three or four times, the carbon dioxide is reduced to an amount too small to be measured.

The board E is now removed, the burner again lighted, and the tube heated to redness. The gas should be passed backwards and forwards, as in the case of the hydrogen; but now it can be passed much faster. The light is extinguished, the apparatus allowed to cool, and the volume noted. It should be the same as before burning, or at least no less. If less, it shows that the hydrogen and possibly the carbon monoxide were not completely burnt, or that potassium hydrate was allowed to enter the burette and pass up into the capillary tube leading to the silica tube. Any increase in volume is due to ethane or to a higher member of the series. This increase in volume, if due to ethane alone, may be read at once as the percentage of ethane. The gas is again passed into A, the carbon monoxide removed, and the residue measured. The loss in volume is the percentage of methane if there was no ethane. If ethane was present, the percentage of ethane is doubled, and subtracted from the total amount of carbon dioxide formed. For example, suppose a mixture of the following gases in the residue: 8 c.c. of nitrogen, 20 c.c. of methane, and 7 c.c. of ethane, with a total volume of 35 c.c. Upon burning, the nitrogen, of course, is unaffected; the methane burns to carbon dioxide, but has the same volume as before; but the ethane doubles its volume on burning. The total volume will be 42 c.c.; 42 less 35 gives 7, the percentage of methane. When passed into potassium hydrate, the loss in volume will be 34 c.c.; 34 less 14 (double the percentage of ethane) gives 20, the percentage of methane. In removing the carbon dioxide, the same fractional method has to be resorted to as in the case of the carbon monoxide determination mentioned above. The sum of the various constituents determined thus far is subtracted from 100, and the residue is nitrogen; or the residue after removing the last of the carbon dioxide is the nitrogen percentage when the oxygen content of the silica tube has been added to it.

The following are the results obtained in a number of analyses made by this method alone and when combined with the cuprous chloride method:

First Samples.		*Second Samples.*	
No. 1.			
CO removed with CuCl	4·6	CO removed with CuO only	14·0
CO removed with CuO	9·6		
No. 2.			
CO removed with CuCl	11·2	CO removed with CuO only	21·9
CO removed with CuO	10·6		
No. 3.			
All CO removed by CuO	16·8	All CO removed by CuO	17·0
No. 4.			
All CO removed by CuO	15·5	All CO removed by CuCl	15·0

In conclusion, attention may be called to the fact that in the Jaeger method, as here outlined, if the carbon monoxide was not completely removed, it would place an error on the hydrogen due to the use of a potassium hydrate pipette where the levelling bulb is placed in the illustration. After repeatedly experimenting with this method for the past two years, the writer has a decided preference for it as compared with the cuprous chloride, palladium oxide, and explosion method, from the standpoint of both accuracy and convenience.

The meeting of the Waverley Association of Gas Managers, which was fixed for the 20th inst., in Edinburgh, has been postponed to Friday, the 4th prox.

Messrs. William Sugg and Co., Limited, intimate that they will have on view, at their showrooms in Regency Street, Westminster, during "Institution Week," the historic burners exhibited by Mr. W. J. Liberty, on the occasion of his recent lecture before the Illuminating Engineering Society at the Society of Arts.

THE LARGEST SPIRAL GASHOLDER IN THE WORLD.

Inauguration Ceremony at Oldham.

A LARGE party of Lancashire, Yorkshire, and Cheshire engineers assembled at Oldham last Wednesday, on the occasion of the inauguration of the spiral-guided holder, which has been erected by Messrs. Robert Dempster and Sons, Limited, of Elland, at the Hollinwood Gas-Works. Illustrated particulars of the holder were given in the last number of the "JOURNAL" (p. 655).

The visitors, who numbered about one hundred and twenty, met at the Victor Street side of the station, where they were welcomed by the Mayor (Alderman Ashworth), Alderman Herbert Wilde, J.P. (Chairman of the Gas Committee), Alderman Thompson, J.P. (Vice-Chairman of the Committee), Mr. Arthur Andrew, the General Manager of the Corporation gas and water undertakings, Mr. Tim Duxbury, the Gas Engineer, and Mr. Isaac H. Massey, the Assistant General Manager.

Painted in a dull grey, the holder was greatly admired. It stands just within the borough of Oldham, and only about a couple of hundred yards from the Manchester boundary.

Mr. J. W. BROADHEAD (the Managing-Director of Messrs. Robert Dempster and Sons, Limited) said they were assembled to celebrate the official opening of what was the largest spiral gasholder in the world; and he thought one of the prettiest. They would also be interested to hear that the holder had come together and been inflated without the slightest hitch. His duty, however, was to request the Chairman of the Gas Committee to open the gates leading to the gasholder yard—he, personally, would designate it the "Gasholder Park," for the planning and arrangement of it reflected the greatest possible amount of credit on Mr. Timothy Duxbury, the Engineer, and his colleague, Mr. Lemon. He asked the Chairman to accept from the Contractors for the tank (Messrs. Jonathan Partington and Sons, of Middleton Junction, near Oldham) and his own firm a gold key with which to open the gates.

The inscription on the key, which was surmounted by an enamelled picture of the holder, was as follows:—

OLDHAM CORPORATION.

INAUGURATION OF THE NEW SPIRAL-GUIDED GASHOLDER,

Hollinwood, 4th June, 1913.

ALDERMAN HERBERT WILDE, Chairman of the Gas Committee.

Mr. DUXBURY, before requesting the Chairman to bring the holder into use by opening the outlet-valve, read the description of the new holder given in the "JOURNAL." He paid a generous tribute to the work done by the Contractors, and said he had the greatest possible pleasure in asking his Chairman to set the valve in motion, so as to turn gas into the district and to the other holders.

Alderman WILDE thanked Mr. Broadhead for presenting him with the key as a memento of the occasion. Speaking on behalf of the Gas Committee, he said he could assure the Contractors that they were very well pleased with the work which had been carried out. Before the order for making the tank was placed with Messrs. Partington, there was some diffidence as to entrusting them with the work—solely because they had not had any experience in building gasholder tanks. But the firm had had plenty of experience in constructing tanks for mills and textile factories; and the Committee felt that they were justified in giving the contract to them. The Hollinwood Gas-Works had been a source of anxiety to the Committee for some years, owing to the great demands made upon them for gas in the district. In the year 1888, the total quantity of gas delivered from the works was 290 million cubic feet; but in 1912 it had risen to 750 millions—an increase of 160 per cent. in twenty-five years. The maximum quantity of gas delivered in twenty-fours in Hollinwood in 1888 was 2 million cubic feet, against 4 millions in 1908—an increase of 100 per cent. They would thus see that the Committee were compelled to look round for further storage capacity, as well as to find a suitable site for the projected new holder. No land was available for so large a holder inside the present works, so the Committee sought for a suitable site as near the works as possible, although at that time they owned a plot of land at Bower Clough, close to the Hollinwood station. This land, however, was deemed unsuitable for the purpose, owing to colliery workings. Another plot of land, almost opposite the Hollinwood Gas Offices, was next inspected. The site was in every way a convenient one; but it was found that, owing to rights of light, a three or four lift holder could not be erected there. Eventually the Committee decided upon the present site, having been compelled, as they saw, to come out into an open field. The land, after having been bored, proved suitable, and he was pleased to be able to show the visitors a structure of prodigious proportions which reflected great credit on the builders. Again, it should not be forgotten that another advantage of the present site was that it was within their own boundary; so that the rateable value of the new £50,000 holder would flow into the local borough funds. It was in August, 1910, that Alderman Thompson, the then Chairman of the Gas Committee, and now his very esteemed Vice-Chairman, cut the first piece of turf for the excavations for the tank, which was finished and ready for water on Oct. 20, 1911. The steel holder was filled with air on Oct. 30, 1912, having taken some twelve months to complete. Though until now it had not been filled with gas to its full capacity, it had, during the last winter, stood the test of very severe gales when nearly completely inflated. By the erection of the new holder, their storage capacity had been increased from 2¾ to 7½ million cubic feet, so that they would not require to make any extensions at the Higginshaw works for some years, as by opening the valves it would be possible to transmit gas to that district. He really thought he was correct in describing the new holder as prodigious—the Liliputians thought that of Gulliver [laughter]—for it would hold nearly as much gas as the other thirteen holders put together. Altogether they had in Oldham fourteen holders, with a total storage capacity of 12½ million cubic feet. Those who saw the new holder in its black state and who saw it now in its new coating of grey, would be compelled to admit that the structure was nothing like the eyesore which people said it would be. He even thought that the Mayor, who was a member of the Hollinwood Improvement Association, would admit that the structure improved the neighbourhood, and that they would, in course of time, be thankful for such a landmark. This was the fourth spiral gasholder erected by Messrs. Robert Dempster and Sons for the Oldham Corporation; and he was glad to say that all of them had given entire satisfaction. [Applause.] One advantage of the new holder was that they hoped to obviate the necessity of making much, if any, water gas in future. Great credit was due to the Assistant-Manager, Mr. Lemon, for his excellent work in connection with the laying-out of the grounds surrounding the tank and holder, and to Mr. Duxbury, the Engineer, and his chief draughtsman, Mr. Kershaw, for the very efficient way in which the works had been designed and carried through. He was very much obliged to so many engineers for visiting them at Hollinwood; and he hoped they had been able to show them something which would, at any rate, provide food for reflection.

The MAYOR (Alderman Ashworth), in proposing a vote of thanks to Alderman Wilde, said that gentleman was thoroughly devoted to the duties of the Committee over which he presided. He (the speaker) had been glad to hear that there was a possibility of their being able "almost" to do away with the water-gas plant at Hollinwood. This, however, did not go far enough for him. What he wanted Alderman Wilde to do was to eliminate the word "almost," and do away with the plant entirely. Speaking as a resident of Hollinwood, he trusted that the new holder would be used to its full capacity, and so obviate the necessity of manufacturing water gas.

Alderman JASON THOMPSON, J.P. (Vice-Chairman of the Gas Committee), in seconding the vote of thanks, said he had enjoyed the friendship of Alderman Wilde for the last ten years, and he assured the visitors that no man had devoted more attention to, or taken a greater interest in, the work of the Gas Department. He (the speaker) well remembered the vast amount of work put into local gas matters when the Corporation's Bill was promoted in 1909, and the energy displayed throughout the negotiations by Alderman Wilde. At that time, the chief objection to the holder was that it would be an eyesore, and spoil the rural aspect of the district. Alderman Wilde, however, did not believe it. He thought the skill and ingenuity of their Engineer would easily overcome the difficulty; and, as the visitors saw, the holder was anything but an eyesore. As a matter of fact, he thought it improved the district. [Laughter.] They were all delighted at the completion of the holder; and Alderman Wilde deserved great credit for the excellent work he had done.

At the request of Mr. Duxbury, Alderman Wilde brought the new holder into use by opening the outlet valve; Mr. Duxbury adding that he took the opportunity of publicly thanking Mr. T. Kershaw, his chief draughtsman, and Mr. Lemon for the excellent services they had rendered him.

Luncheon at the Town Hall.

The party were then conveyed in special cars to the Town Hall, where luncheon was served. Alderman WILDE presided.

After the repast, the usual loyal toast having been honoured,

Councillor W. KAY, Chairman of the Gas Committee of the Manchester Corporation, proposed "The Oldham Gas Committee, and Success to the Undertaking." He said he hoped his hearers would believe him when he said how much he esteemed the privilege of having this toast entrusted to him, because one appreciated an opportunity like the present to be able to pay well-deserved tributes to public-spirited men who were giving their time and intellect to forward the great industry in which they were all so deeply interested. Speaking particularly of the Oldham Gas Committee, it was, of course, common knowledge that the Oldham gas undertaking was very successfully managed indeed. They had been happy in their choice of officials, with the result that the progress of the undertaking had been steady, and, he ventured to say, satisfactory to everybody. As to gas undertakings generally, he had had the opportunity of stating on more than one occasion—and he took pleasure in doing so again—that, as controllers of gas undertakings, they had unlimited opportunities for doing good; one of these opportunities being that of avoiding and overtaking their inherent foe, the smoke nuisance. Situated as they were in the North of England, where coal was so cheap, it had always been somewhat difficult to combat the smoke problem; but it was being tackled with an increasing amount of success every day. In the South of England, the same difficulty was not experienced; so that it was very gratifying to know that Northern gas undertakings were all doing better in the making of gas and gaseous fuels and appliances. With regard to Oldham, they had seen that day another step taken towards the completion of what they would all devoutly like to see—a smokeless town; and he sincerely hoped that the Oldham undertaking would continue to prosper. Oldham had an advantage which was not given to all of them. He referred to the fixed annuity they had to pay. They could do much better with a fixed annuity than could other gas undertakings (like Manchester, for instance), where, in spite of exceedingly keen competition from the Electricity Committee, the Gas Department had to hand over—not £50,000, but £60,000 or £70,000, according to the needs of the city. This, to his thinking, was not as it should be. It

was not fair that other departments should be bolstered up at the expense of the gas consumer—a policy which was sadly too prevalent at the present time. He thought the toast of the "Health of the Gas Committee" was of as much importance as that of "Success to the Undertaking." An undertaking with an inefficient Committee would soon produce a chorus of disapproval from the local ratepayers. But, fortunately for the Oldham Gas Department, its successes had been unbroken; and he cordially wished it continued success. He thought he ought to say a word about another undertaking with which they were now more closely allied than they had been in the past. He referred to the British Commercial Gas Association—[applause]—of which both Oldham and Manchester were members. He thought that the Association, properly managed and carried on, would be of inestimable good in the future, and would bring about a perfect understanding in every way between consumer and producer. After alluding to the cordial relations which had always existed between the Oldham and Manchester Gas Departments, Mr. Kay said that it was of the utmost importance that neighbouring undertakings should work amicably together, and be willing to place information at each other's disposal as opportunity offered. For instance, the very best of understandings existed between Manchester and the neighbouring borough of Salford—a friendship which he hoped would remain unbroken for many years. Turning to the labour question, Mr. Kay remarked that, though they were living in peaceful times, there was never a more anxious moment in the industrial world than the present. There was a spirit of unrest abroad; and matters needed watching very closely. These would, he hoped, be settled by a friendly interchange of ideas between master and men, rather than by strikes and lock-outs, which always led to trouble and confusion on both sides, and benefited nobody in the end. Addressing Alderman Wilde, the speaker, in conclusion, said: I propose this toast with feelings of cordial goodwill to you and to your Committee. We all wish the Gas Committee every prosperity, and every success to the undertaking over which you preside.

The toast was heartily honoured.

Alderman WILDE, in reply, said he and his fellow-members of the Committee cordially appreciated Councillor Kay's kind remarks, and particularly his allusion to the friendship which had always existed between Oldham and Manchester. This friendship would, as Councillor Kay implied, be of very great value in carrying out the work in which both their Committees were interested—the work of the British Commercial Gas Association. He (Alderman Wilde) had no intention to revert to what they had been doing that day; but he might, perhaps, be pardoned for saying that the Oldham undertaking had now assumed somewhat large proportions. Their output of gas at the present time was about 1563 million cubic feet a year; and for selling price they ranked as about the third lowest-priced town in the country. They could not, of course, come anywhere near their friend from Widnes, whom he was delighted to see that day. They were now erecting a 2-million vertical retort plant at Hollinwood on the Glover-West system of continuous carbonization; and the Oldham Gas Committee hoped in the near future to have the pleasure of inviting those present to the inaugural celebrations. They were always glad to welcome gas engineers to Oldham, because he sincerely believed that they in Oldham had been "in the van" in regard to gas making for many years. For the past ten years, and especially since the advent of Mr. Duxbury, they had made wonderful progress. As a matter of fact, ever since Mr. Duxbury came to Oldham he had had a very busy time indeed; and there was no doubt that he had done excellent work. He had brought them right up to the times in regard to gas making; and the Committee had every confidence in his judgment. They had, as a Committee, always been ready to support him, and would continue to do so. In Mr. Andrew, the General Manager of the Gas and Water Department, Oldham possessed a servant second to none in the country. He was a man who commanded the respect not only of the members of the Gas Committee, but the whole of the Borough Council. Mr. Andrew was a man who gave of his best to the town of Oldham. If it was in his (Alderman Wilde's) power to recompense him as he thought he deserved recompensing, then his salary would be double what it was that day. On the distribution side they were forging ahead rapidly. Only recently they had opened extensive show-rooms in the town, and they had proved remarkably successful. Prior to the opening of them on Jan. 14 last, the total number of gas-fires supplied throughout the town was 869. This was for the whole period of the undertaking's existence. But since the opening of the show-rooms, and up to the end of May, they had fixed no fewer than 246 fires; so that in the course of four months they had sent out nearly one-third as many fires as they had previously done in a very large number of years. This clearly showed that the policy of opening gas-fire and cooker show-rooms was a sound one, both financially and commercially. The Committee felt that this improvement would go on for many years Turning to the subject of benzol and town gas, Alderman Wilde said a discussion had lately been going on in the papers with regard to benzol; the suggestion having been made as to the desirability of stripping town gas of its benzol in order to use the product for automobile engines. When he read the first article on the subject, he was very much surprised, because he knew that they used a great deal of benzol for the enrichment of gas. He, accordingly, discussed the matter with Mr. Duxbury, for he could not see how the suggestion could be carried out except by supplying a very low quality of gas to the consumer. Mr. Duxbury, however, told him that, unless the public were content to be supplied with 10 or 12 candle gas, it was not possible. Their present illuminating power was 18 candles; so the scheme was unworkable in a town like Oldham, where more flat-flame burners were in use than incandescents. Motorists would, therefore, have to look to other than town gas-works for a solution of their difficulty. He simply mentioned this matter *en passant*, to show that the Gas Committee were fully alive to what was required of them. Householders and manufacturers had the first claim upon their commodity. He cordially thanked Councillor Kay for the kind way in which he had proposed the toast, and the visitors for the hearty manner in which they had received it.

Alderman JASON THOMPSON, J.P., proposed "The Contractors," coupling with the toast the names of Mr. Broadhead and Mr. Wild—the latter representing Messrs. Partington. He said Messrs. Partington had risen to the occasion in the best possible way, and the Committee were delighted with what they had done. The Oldham authorities would certainly not have the slightest hesitation in entrusting them with similar work again; and he hoped those outside Oldham would consult them for tank work. With regard to Messrs. Dempster, this was the fourth spiral-guided holder they had erected for the Oldham Corporation—two at Higginshaw, one at Oldham, and one at Hollinwood. They had done splendid work for Oldham during the last twelve years. He could say without the slightest hesitation that the whole of their commercial transactions with Messrs. Dempster had been of the pleasantest character. Everything was carried out to the letter and spirit of the contract. He sincerely hoped this would not be the last contract the firm would carry out for Oldham.

Mr. BROADHEAD, who received a cordial welcome, thanked Alderman Thompson, the Vice-Chairman of the Gas Committee, for the felicitous terms in which he had proposed the toast of "The Contractors." It had been said that Messrs. Robert Dempster and Sons had had a large share of work given to them by the Oldham Corporation during the last few years. The firm had laid themselves out to cater for the Oldham Corporation's requirements; and he was very pleased they had given them every satisfaction. Reference had been made to a visit by a deputation of the Gas Committee to Elland some years ago. They would not, however, recognize the works to-day if they re-visited them, because they were very much enlarged. He thought it unnecessary for him to say much about spiral-guided gasholders. For many years past, he (the speaker) had said that the spiral-guided holder would entirely displace all other types; and this was certainly coming to pass. Practically all gasholders now erected were spirally-guided, except large ones (say) twice the size of the Oldham one, where engineers were still waiting for others to set an example. The Oldham Corporation had set a very good example by building four four-lift spiral-guided gasholders. These four holders and one erected at Belfast—making five four-lift holders in all—had been erected by his firm, out of a total of eight such holders constructed up to the present time. He thanked the various speakers for the complimentary remarks they had made about the new holder. They, as contractors, at any rate, were proud of it, and were not afraid of criticism. He hoped the present pleasant relations existing between the Oldham Corporation and his firm would long continue. Reference had been made to the work done by the British Commercial Gas Association, of which his firm were members. They were members because they realized that the more gas was sold the more apparatus would be required; and they considered that the work done by the British Commercial Gas Association was calculated in every way to bring this result about. He sincerely hoped the good work done, not only by the various corporations themselves, but by the aid of show-rooms controlled on lines laid down by the British Commercial Gas Association, would result in increasing prosperity to all gas undertakings in general and to the Oldham Corporation in particular, in which gas-plant manufacturers would be very pleased to participate. He thanked them for the hearty manner in which they had received the toast.

Mr. WILD, on behalf of Messrs. Partington, also responded. He confessed that at the time the firm took the contract for the tank they did so with some trepidation; but, as they had made tanks for other purposes, he saw no reason why they should not, having the latest machinery, be able to construct apparatus of the kind required by the Oldham Gas Department. He was glad the firm had succeeded in their efforts. They had nothing but the best of recollections of their work at Hollinwood, and their association with Messrs. Dempster.

The MAYOR, in proposing "The Visitors," said he was very pleased to see so many engineers and managers of other undertakings present. This, he thought, was one of the good features of municipal government of the present day. A spirit of helpfulness, educationally, seemed to prevail at their gatherings; and he was sure this was of ultimate benefit to the various undertakings

Mr. J. C. BELTON, President of the Manchester District Institution of Gas Engineers, who responded, thanked Alderman Wilde and his Committee most heartily for the welcome extended to the visitors. He assured them that it had been a great pleasure to inspect the Oldham Gas-Works, the Engineer of which stood very high in the respect and esteem of the members of the Manchester District Institution. It had also afforded them much pleasure to witness the great success which had attended the engineering enterprise carried out at Hollinwood by Messrs. Robert Dempster and Sons—an achievement which was of no small importance, both to the borough of Oldham and to the Contractors. Mr. Belton went on to speak of the educational advantages of visiting different works; and said that some of their members who had charge of the largest works in the country often found that they could learn something when going over smaller ones. Again, those who were engaged in small works found out something useful when visiting larger ones. It was this spirit of co-operative helpfulness which tended to promote the general efficiency of the gas engineering profession. Nothing whatever was lost to employers who paid the expenses of engineers to visit other works. Continuing, Mr. Belton went on to refer to the question of the allocation of gas profits, which, he contended, primarily belonged to those who produced them. The whole matter resolved itself into a commercial principle. If consumers were not benefited in proportion to the success of the undertaking, such success being due to the extension of consumption, they were not getting fair treatment. He congratulated the Oldham Corporation upon having such a magnificent output as 1563 million cubic feet per annum, and upon the up-to-date character of their works. The visitors had had the pleasure of seeing the latest design in spiral-guided gasholder construction and gas-engineering enterprise. It spoke volumes for the work of the Contractors and for the ability of Mr. Duxbury, the Engineer. The spiral-guided holder was scientifically correct and commercially economical. Turning to the Chairman, Mr. Belton said the Oldham Corporation had in Mr. Duxbury an engineer of whom they were justly proud, and one whom they, as members of the Manchester District Institution of Gas Engineers, were equally proud to know as a friend. They had the greatest possible pleasure in attending the proceedings that day in order to testify to his merit. Mr. Belton concluded with a strong appeal to visiting engineers to do all in their power to help forward the educational work of the

British Commercial Gas Association, with a view to the ultimate suppression of the smoke nuisance.

Mr. R. G. SHADBOLT (Grantham) also responded to the toast.

Mr. ISAAC CARR (Widnes), answering calls for a speech, assured those present that he was pleased to be with them on the occasion of the inauguration of the spiral-guided gasholder at Hollinwood, and had been much interested in all that had taken place. Someone had passed a remark about "cheap gas." He had heard someone speak about 4½d. per 1000 cubic feet into the holder. He (Mr. Carr) could do this with his old apparatus; but when he got his new plant he would take the 4d. off, and bring his holder cost down to a halfpenny. [Applause.] At Widnes, their present maximum price was 1s. 1d. per 1000 cubic feet with a minimum of 9d. If 4d. were taken off, the prices at Widnes would be 9d. maximum and 5d. minimum. [Applause.] He had been greatly interested in Alderman Wilde's remarks respecting stripping town's gas for the purpose of obtaining benzol, and endorsed all the worthy Alderman had said on this point.

The usual votes of thanks to the Chairman and his colleagues brought to a conclusion an enjoyable and lengthy function.

UTILIZATION OF GAS BYE-PRODUCTS.

Koppers System of Carbonization.

In the issue of "Gas Record" (New York) for the 10th ult., Mr. Heinrich Koppers dealt with the subject of the utilization of the residual products of gas manufacture. In the course of the article, he made the following remarks.

The supply of gasoline is growing less; and oil for carburetting water gas is increasing in value. It is the custom in America to sell gas of high candle power, which to-day is a very great mistake, and means great waste, even when Welsbach mantles are used. The best efficiency for lighting is maintained with a gas of (say) 500 to 550 B.Th.U. per cubic foot. This means coal gas, and also means no more carburetted water gas, as it is too expensive. By producing coal gas of 500 to 550 B.Th.U., a substitute for gasoline is created, as this gas allows the liquefaction of all the heavy hydrocarbons. This process is in use all over Germany and in England in nearly all coke-oven plants, and is now being introduced in municipal gas-works in Germany.

Coal gas has hitherto been made in small retorts—horizontal, inclined, and vertical. This is a "teaspoon" operation, as coal is charged into the retorts in relatively small quantities. The settings are fired by gas coming from producers attached to the settings. The best coke received is used in these producers in large quantities, and the waste heat is recuperated. This system of heating is antique, even with the use of waste heat under the grate; while the gases from the producers carry over large quantities of flue dust, which deteriorates the whole retort-setting, so that constant repairs and renewals have to be made. Modern practice is carbonization in bulk charges of not less than 10 tons, using horizontal chamber ovens standing in the open (not in a house), as only this keeps the workmen healthy. Cleaned producer gas is used as fuel, and gas and air are regenerated, not recuperated. Using regenerators and cold-cleaned producer gas made from any cheap grade of fuel (not using the best high-grade and high-priced coke), the use of not more than 1120 B.Th.U. per pound of coal carbonized can be guaranteed. The places where coal is carbonized for the production of illuminating gas should be concentrated, and the high-pressure system used for distribution. Coal gas which has been treated for the liquefaction of the heavy hydrocarbons does not contain any noticeable quantity of naphthalene, and is therefore best adapted for high-pressure distribution.

Coal gas of 500 to 550 B.Th.U. must come in America, and it will give to the public coke as a substitute for anthracite, and motor fuel as a substitute for benzine or gasoline. Tar or tar oil can be used in Diesel engines to replace expensive oil as fuel. Tar oil can also be used for disinfection and for preserving timbers; tar and pitch for building roads; ammonia for chemical purposes; and sulphate of ammonia as a fertilizer, which, if properly used, will yield to the farmer a return of at least 200 per cent. The farmers in Germany last year used the total production of 465,000 metric tons, of the value of £6,510,000, which will give them a net profit of £13,000,000.

Plants on the Koppers system are in operation and under construction at the following gas-works:

	Ovens.	Cub. Ft. per Day.
Vienna Corporation Gas-Works—		
Simmering	46	5,250,000
Leopoldau	72	7,400,000
Berlin Corporation—Gas-Works IV., Danzigerstrasse	40	4,800,000
Kiel Gas-Works	23	2,750,000
Buda-Pesth Corporation Gas-Works	78	9,500,000
Tokio Gas Company—		
Omori works	36	4,200,000
Sunamura works	15	1,950,000
Birmingham Corporation Gas-Works	12	1,400,000
Do. (repeat order)	54	6,500,000
Königsberg Gas-Works	35	4,250,000

In the description of the Chester Gas-Works which appeared in the "JOURNAL" last week (p. 660), the date of the installation of the present retort-house plant should have been given as 1900-1 (not 1890-1).

COMBINATION OF ELEMENTARY NITROGEN WITH OXYGEN AND HYDROGEN.

The problem of the fixation of atmospheric nitrogen is obviously of great importance to the gas industry—firstly because its practical solution will affect the output and price of fertilizers, such as sulphate of ammonia, and, secondly, because many proposed methods of fixation require a supply of hydrogen, for the production of which, at low cost, modified gas-works' processes are likely to be applied. Hence the discussion of the problem by Dr. F. Haber, of Berlin, in a communication to the German Chemical Society, on April 26 last, presents many points of interest to the gas profession. The following is an abstract translation of the report of Dr. Haber's lecture, which is given in the "Journal für Gasbeleuchtung" of the 31st ult. (p. 514).

The world's requirements of fixed nitrogen amount, at the present time, to 750,000 metric tons per annum, and are increasing at the rate of about 5 per cent. each year. The value of the yearly output approximates to £50,000,000. Naturally the soil should not require nitrogenous manure, because the nitrogen is returned to it by animals, and losses due to decay and combustion are restored by the activity of nitrifying bacteria, and by the nitrogenous gases dissolved by rain from the atmosphere after lightning discharges. But the natural return of nitrogen to the soil by animals is interfered with by the bread and meat requirements of densely populated centres. An adult person annually discharges over 11 lbs. of fixed nitrogen in the form of urea, which would account for ten times the present nitrogen requirements of the world. But, the more the population increases, the less is this natural return of nitrogen to cultivated land. If our knowledge of certain biological conditions were better, it would probably be possible to establish in the soil colonies of independent bacteria which would convert per acre large quantities of atmospheric nitrogen into fixed nitrogen, or nitrogen-fixing organisms might be discovered, which would thrive on the nodules of the roots of cereals equally as well as they now thrive on those of leguminous plants. Were this possible, there would be no need for nitrogenous manures; and a rapidly developing chemical industry would cease to exist. But such a consummation seems very far off, and meantime nitrate and other nitrogenous fertilizers must be used. The stores of nitrate in Chili will last for half-a-century, even with an increasing annual output. Coal contains a great store of nitrogen, which, however, is lost when the coal is burnt. By distillation of the coal, about 2 per cent. of its weight is recovered as ammonia. If the whole of the coal raised were carbonized, the fixed nitrogen recovered would amount to far more than present requirements, but the extent to which coal is converted into coke does not depend on the 2 per cent. of ammonia which is recoverable. Actually the ammonia recovered is only about a tenth of the total. But even without increasing the quantity of coal carbonized, a considerable increase is possible in the recovered ammonia; for in England about half, and in America about four-fifths, of the coke produced is made without recovery of bye-products. In Germany their recovery is very nearly exhaustive; and it is progressing rapidly in other countries. Nevertheless the demand for fixed nitrogen is increasing at a greater rate. Apart from carbonization, the Mond process admits of the recovery of 70 per cent. of the nitrogen of the coal; but this process is generally only applicable where there is use for large quantities of semi-water gas. Peat may be used in place of coal in special circumstances.

As to chemical methods of fixing nitrogen, Bunsen and Playfair had made potassium cyanide from potash, carbon, and nitrogen, and Margueritte and Sourdeval had replaced the potash by oxide or carbonate of barium, and had obtained ammonia by saponification of the barium cyanide. Mond used the latter process in the ammonia-soda industry, but gave it up because of the greater economy of ammonia recovery from coal by gasification with steam. The Baden Aniline and Soda Works later studied and perfected the process, working the nitrides of titanium, silicon, and aluminium, but ultimately preferred another method of fixing nitrogen. High-tension arcs were used to imitate the effect of lightning, and thus produce nitrogen compounds from the air. The more important processes, in which the energy of waterfalls was applied to this end, were those of Schönherr, Birkeland and Eyde, and Pauling. Nitric oxide being formed from the nitrogen and oxygen of the air, its conversion by air and water to nitric acid was an easy matter. Nitric oxide is an endothermic compound, and theoretically one unit of electricity should be capable of converting 1·235 lbs. of nitrogen into nitric oxide. But this is a utopian ideal, depending upon the direct utilization of electrical energy for the formation of the chemical compound. Working indirectly through the heat liberated in the electric arc, 0·25 lb. of nitrogen should theoretically be fixed per unit; but, in practice, the concentration of the nitrous gases does not exceed 2·5 per cent., in place of a calculated 42 per cent., and consequently only from 0·024 to 0·035 lb. of nitrogen is fixed per unit of current consumed. An appreciably increased yield can be expected only if the formation of nitric oxide electro-chemically, instead of through the heat of the arc, is achieved.

Dr. Haber has attempted to utilize a lower temperature with the arc—viz., 3000° C., at which equilibrium should theoretically

occur with a concentration of less than 5 per cent., instead of 3500° C., at which the concentration should be 6 per cent. of nitric oxide. Working with a high-tension arc in a cool quartz tube, at a pressure of one-seventh of an atmosphere, concentrations were actually attained of 10 per cent. of nitric oxide in air, and of 14½ per cent. in a mixture of equal volumes of nitrogen and oxygen. These results clearly showed that a higher concentration than the thermodynamic was attainable through an equilibrium which depended on the electrical arrangement and working of the apparatus. Nearly as high a concentration of nitric oxide in air was attained by taking advantage of the rise of density of the field of the arc with the pressure (the current being constant), and the fact that the concentration of nitric oxide increases up to a certain maximum with the field-density. But, if a lower temperature than that of the electric arc can be utilized (with a lower concentration of nitric oxide), cheaper sources of heat become available. For instance, it is known that the yellow border of the flame of a mixture of oxygen and acetylene, issuing from a small nipple, produces much nitric oxide—viz., 4 to 5 molecules of nitric oxide to 100 molecules of carbonic acid. Burning carbonic oxide in air enriched with oxygen—the gases being preheated—a concentration of 1·2 molecules of nitric oxide to 100 molecules of carbonic acid was the highest attainable at ordinary pressure. But the yield could be increased by increasing the pressure up to about 9 atmospheres, above which no appreciable increase in the fixation of nitrogen occurred. Without preheating of the gases, 3 molecules of nitric oxide to 100 molecules of carbonic acid were thus obtained; with a mixture of equal volumes of oxygen and nitrogen instead of air, 5 molecules of nitric oxide; and with a mixture of two-thirds oxygen and one-third nitrogen, 5¼ molecules of nitric oxide. With preheating of the gases, 6 molecules were obtained. This is equivalent to fixing over 0·06 lb. of nitrogen by the aid of one pound of carbon burnt to carbonic oxide. The heat of combustion of the latter is equivalent to 3 units of current, by means of which 0·107 lb. of nitrogen could otherwise be fixed. This process, however, is specially hampered by the necessity of using air enriched with oxygen, and can therefore only come into consideration in special circumstances.

Thus the combination of nitrogen with oxygen is restricted to a few localities, when it is effected by means of the high-tension arc; and, while this restriction does not apply when heat from fuel is utilized, there are in that case other attendant disadvantages. Attention is therefore chiefly directed to the combination of nitrogen with hydrogen, which may be accomplished in several indirect ways. Two of these have been technically utilized. Both employ current; but the consumption of energy per unit of nitrogen fixed is much less than in the case of nitrate from the air. They are the process of Frank and Caro, and Serpek's process. In the latter case, ammonia is a valuable bye-product of the manufacture of alumina from bauxite. The Baden Aniline and Soda Works, moreover, have this year converted from a laboratory into a technical process a method for the direct combination of nitrogen and hydrogen by the aid of catalysts at a high temperature. Nitrogen and hydrogen, in the proportions of about three to one by volume, are circulated, at a pressure of 100 atmospheres or more, over a catalyst, which effects the combination of a small proportion of the mixture. The ammonia thus obtained is removed from the uncombined gases by condensation or washing, and the gases are re-circulated over the contact agent, with a fresh supply to make-up the loss due to the conversion into ammonia. Apart from the power incidentally required in any works, this process demands only the small amount of energy necessary for compressing the mixture of gases and for circulating them, as the heat abstracted at one stage is restored in the next. The cost of hydrogen is the most important factor, and this may be taken at 5d. to 5½d. per lb.

It was a long time before experience showed that large-scale working with gases circulating at a pressure of 100 to 200 atmospheres was practicable. Experience has further demonstrated that, while the ammonia concentration decreases as the rate of flow increases, other conditions being unaltered, the product of concentration and the rate (which is a measure of the mass formed in unit time of the ammonia produced in the apparatus), do not remain constant, but rise steadily and considerably. Apparently ammonia retards its own formation in proportion to its concentration. The first catalysts to be used were iron, manganese, nickel, and calcium; then chromium and cerium. But these rapidly lost activity in use, and finally osmium and uranium were tried. Above 500° C., several pounds of ammonia were obtained per hour for every litre of space filled by the catalyst. Thus it became possible to carry on the synthesis under high pressure on a practical scale in a small space. The Baden Aniline and Soda Works have now succeeded in replacing osmium and uranium by cheaper catalysts, and in employing hydrogen obtained from coal. The transition from electrolytic hydrogen to the latter involved a study of the harmful action of its impurities. The result of the work has been the opening this year of the works at Oppau. Some of the sulphate synthesized there was exhibited by Dr. Haber.

The atmospheric nitrate processes require much power for their working, whereas with the synthetic ammonia process the power consumption is small. It can thus be worked in ordinary industrial districts. It should not, however, suppress existing methods of obtaining ammonia, because the world's requirements are so large that there will be ample scope for them all concurrently.

VALUATION OF WATER-WORKS UNDERTAKINGS ON TRANSFER TO MUNICIPAL AUTHORITIES.

By E. J. Silcock, M.Inst.C.E., F.S.I.

[A Paper read before the Institution of Water Engineers, June 5.]

It is the recognized practice of Parliament to favour the ownership and complete control of the public water supplies by local sanitary authorities; and cases are constantly occurring in which Acts of Parliament are obtained by municipal corporations and urban district councils enabling them to purchase by compulsion the undertakings of established water-works companies.

There are doubtless cases where a public supply is required over a large area embracing the whole or parts of several local authorities, and in which, owing to the difficulty of reconciling conflicting interests, a water company can be more easily organized than a joint water board. In such cases, the Legislature still passes Acts of Parliament or confirms Board of Trade Provisional Orders constituting water-works companies; but if there is any competing suggestion of a joint water board, or other form of municipal control, Parliamentary Committees almost invariably favour the latter in preference to a company.

Even where existing water-works companies were carrying out their obligations to the consumers in a proper manner, municipal authorities have, in many cases, obtained compulsory powers to purchase. Many instances of this could be quoted; but it will perhaps be sufficient to mention (as typical cases) Sheffield, Harrogate, Filey, Kettering, Southport, and Fylde.

In Transfer Acts, as these compulsory purchase enactments are called, it is customary to incorporate the Lands Clauses Acts, and to provide that the word "lands" contained therein shall be taken to cover the undertaking of the water company. The purchase price is then settled by arbitration under the provisions of the Lands Clauses Acts, in exactly the same manner as when lands are compulsorily taken for public purposes. The company are required to carry on the undertaking until the appointed day of transfer, which is usually the quarter day next ensuing after the umpire has made his award. The income accruing to the appointed day belongs to the company; and they are required to pay all outgoings up to date, after which the income belongs to the purchasing authority, and they are liable for all expenditure that may be incurred.

The procedure under the Lands Clauses Acts is too well known to need detailed description, but may be briefly outlined. The purchasing authority serves a "notice to treat" upon the owners, requiring them to state the sum of money for which they will part with their property; and a claim is then prepared. Failing acceptance of the claim, each party appoints an arbitrator; the two arbitrators select their umpire; and a tribunal is thus created to settle the sum to be paid.

Strictly speaking, this sum is not the value of the undertaking, but the amount of compensation awarded to the vendors for being compulsorily dispossessed of their property. In order to ascertain the amount of compensation, it is frequently necessary to value the whole undertaking; but it by no means follows that this coincides with the award, as will be seen later. Structural value has only an indirect bearing upon the value of a water-works. The broad principle of valuation almost always adopted is to ascertain the net maintainable annual income, and to capitalize this by multiplying by a number of "years purchase," which is determined by a consideration of the various circumstances affecting the security of the income. It is in fixing the "years purchase" that the greatest differences of opinion occur, and in which the skill and the judgment of the tribunal are most needed.

The determination of the net maintainable income is largely a matter of accountancy; and it is now customary to employ a chartered accountant to prepare financial statements showing the capital accounts from the formation of the company, and revenue accounts extending over a period of five years. The last completed year of the revenue account is taken as the basis; and this is carefully analyzed and compared with the accounts for the previous four years to ascertain whether the income and expenditure are in any way abnormal. It is here that the engineer and the accountant must collaborate to bring their special knowledge to bear upon the problem of reconciling differences, and adjusting (where necessary) the various items of the final year's accounts so that they fairly represent the normal income and expenditure of the company. When competent professional men are engaged upon the task, there is not usually any very wide difference between the figures put forward by the two sides; and the umpire has very little difficulty in determining a just amount for the net income to be used for capitalization. The chief differences arise on the question of maintenance, and the amount to be set aside annually as a sinking fund to replace the perishable or obsolete parts of the undertaking. These are matters which involve engineering knowledge and skill, combined with sound judgment in the application of principles.

Turning now to the most important factor—namely, the number of "years purchase" to be used in the capitalization of the net income—this is obtained by dividing 100 by the rate of interest which should be obtained by an investor; the latter being

determined by the consideration of a number of factors which may be grouped under the following three heads:—

(1) The state of the Money Market, as indicated by the value of gilt-edged securities.
(2) The demand for the particular class of security.
(3) The security of the income.

(1) The condition of the Money Market can be ascertained by an examination of the Stock Exchange quotations in trustee securities, and is a matter of no difficulty. Obviously the "years purchase" would be greater because the rate of interest was less in (say) the year 1900 than it is to-day.

(2) The demand for the particular class of security depends to some extent upon local considerations—such as whether the district is a flourishing one or the reverse, and also upon the size of the undertaking and whether it is a statutory or a non-statutory company. If the company's capital is big enough to secure for it a Stock Exchange quotation, the investors are not entirely confined to the immediate district; and the shares find a ready market if the owner wishes to realize. Therefore the demand for such shares is greater than for those of a small undertaking held entirely by local people. Apart from this, the bigger a concern is, the less likelihood is there of great fluctuations taking place in its income and expenditure. It will be readily conceded that the rate of interest expected by an investor in Metropolitan Water Board Stock would be less than the return he would demand from a small non-statutory water undertaking, whose shares might not be easily realized when required.

(3) The third group of the factors above mentioned, includes the considerations which appeal most to the members of the Institution. The principal points to be considered are as follows: (1) Quality of water. (2) Quantity of water. (3) Age and condition of works. (4) Whether it is a pumping scheme or a gravitation scheme. (5) Whether the works are capable of supplying the consumers. (6) Whether the scale of charges is high or low. (7) Whether the district of supply is growing or declining.

In dealing with the question of the upkeep of the company's undertaking and the number of "years purchase," it must not be overlooked that there are certain parts of a water-works which are either perishable or become obsolete, and which require to be replaced after varying terms of years. This element of value can be dealt with in one of two ways—either (*a*) by decreasing the number of years purchase on the maintainable revenue, or (*b*) by deducting from the maintainable revenue an annual sum to form a sinking fund which will provide the amount required to replace those parts of the undertaking which become worn out or obsolete, as may be necessary from time to time.

The same principle is also applied in certain cases, where supplementary works are required in order to improve either the quality or the quantity of water; but in such cases the deduction is made from the capital sum and not from the "years purchase." Thus, supposing it is necessary to cover a service reservoir, it may be more advantageous to the company to keep the number of "years purchase" high, to capitalize all available revenue, and then to deduct from the capital sum so obtained the cost of covering the reservoir. The same remarks, of course, apply to any other similar work required in order to make the undertaking more perfect.

It is unnecessary to further elaborate these various heads; they can be subdivided and enlarged upon by engineers engaged (as members of the Institution are) in the practical construction and maintenance of water-works. The above list is not by any means complete, but is given in order to indicate the main points for consideration.

The tribunal, after having heard the evidence (often very conflicting) upon these and kindred matters, must weigh the opinions expressed by those representing the various interests, and arrive at a figure for the number of "years purchase." When it is stated that, within the experience of the author, this number may vary from fourteen to forty, it is obvious that there is a wide field for the exercise of judgment.

Having done this, the net maintainable revenue is multiplied by the "years purchase," and the main factor in the valuation of the undertaking is obtained. In an ordinary normal case a 10 per cent. allowance for compulsory purchase would be added; and the sum of the two would give the value of the undertaking.

The above represents the normal case; but, as can be easily imagined, there are not a few instances where other considerations will arise. One of the most common cases is that in which the water company is paying its maximum dividends upon all classes of shares, and has in addition a surplus revenue. In such a case the principle above indicated does not hold good because the shareholders in the water company are not entitled to participate in the surplus revenue beyond the maximum dividends divisible among the shareholders. It is true that there may be back-dividends owing to the shareholders, and that the surplus revenue can be applied for this purpose. But when all back-dividends have been paid off, the company are bound, under the Water-Works Clauses Acts, to reduce their charges to the consumers, and are not therefore entitled to be compensated on the basis of the total revenue derived from the undertaking. In such a case the principle applied is to capitalize a sum representing the total maximum dividends possible for all classes of stock. It would appear on the face of it that a company in such a favourable position should have its maximum share dividends capitalized upon the highest possible number of years purchase. This view, however, when closely examined, by no means follows.

One well-known principle of compensation in cases under the Lands Clauses Acts is the principle which can be summed-up in one word—viz., "reinstatement;" and this principle is often applied to cases where the present shareholders are receiving their maximum dividends. It is applied in this way—namely, that a sum of money is given which will enable the shareholders to re-invest their capital in shares of similar value as a security; in other words, in water-works stock of a similar company.

As an illustration of the way in which such a figure can be arrived at, the following table indicates the revenue derived in 1911 from various water-works undertakings, from which it will be seen that the return to the investor varies from 4 per cent. (equivalent to 25 years' purchase) to £4 17s. (equivalent to 20·6 years' purchase); and the average of the whole list works out to £4 5s. 10½d. (equal to 23·4 years' purchase).

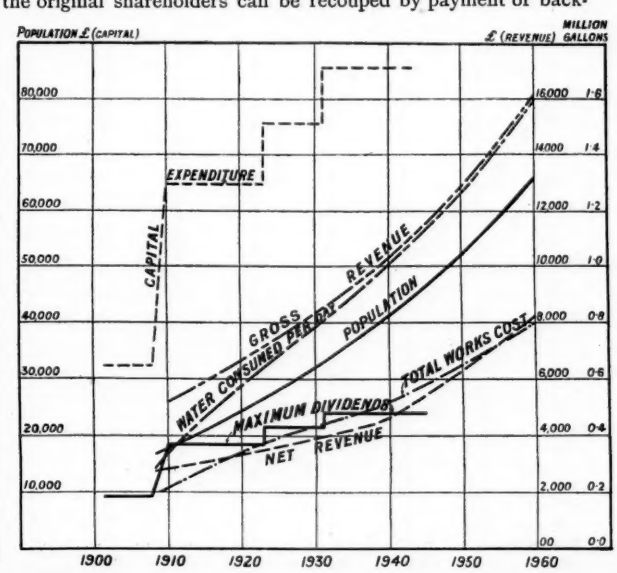
TABLE *showing Rate of Interest Yielded by Water-Works Shares*, 1911.

	Return to Investors. £	s.	d.
Bristol Water-Works ordinary stock	4	5	9
Ditto 1872 ditto	4	6	0
Colne Valley Water Company, 10 per cent. ditto	4	10	0
East Surrey Water Company "B" shares, maximum 7 per cent.	4	6	3
Newcastle and Gateshead Water Company, ordinary stock	4	0	0
Ditto 1876 stock	4	0	6
South Staffordshire Water Company "A" 10 per cent. stock	4	5	9
Ditto "B" 7½ per cent. shares	4	8	9
South Essex Water Company ordinary stock, 10 per cent.	4	6	6
Ditto 1882, 7 per cent. stock	4	17	0
Sunderland and South Shields water stock	4	3	3
Sutton District water stock	4	7	0
Belfast Water Commissioners, 3½ per cent. stock	4	2	0
Ditto, 3 per cent. stock	4	3	6
Total of fourteen examples	£60	2	3
Average " "	4	5	10½

From the above particulars, a valuer could select such typical cases as would enable him to justify the figure he adopts as the number of "years purchase" in his valuation.

Another reason why it does not follow that the number of "years purchase" of a maximum dividend company should be excessively high, is the consideration of the resources of the company in relation to its obligations to a future increase in population. It not infrequently happens that a water-works undertaking is purchased by the local authority at the precise time when the company goes to Parliament to obtain powers to raise additional capital and to carry out further works to cope with the increasing consumption. In such cases, although a company may be paying a high rate of interest on its shares at the moment, it may be that when the additional capital necessary to carry out the new works has been expended, the additional revenue immediately available will be insufficient to enable the company to continue the payment of maximum dividends.

When a water company's works are first established, the capital expenditure is usually out of proportion to the number of consumers; and the net revenue is insufficient to provide full dividends. As the population consuming water increases, this disparity of capital to revenue disappears, and the company becomes a prosperous concern. This arises from the fact that, when the works are first constructed, a margin of capacity is provided over and above existing requirements. If the population is an increasing one, this means that from the time the company can pay maximum dividends until this margin of supplying power is exhausted, the finances of the company show a large surplus, and the original shareholders can be recouped by payment of back-



dividends for their losses during the early life of the concern. The time comes, however, when the company must inevitably seek some new source of supply, and to do this must expend a large sum on capital account. When this occurs, there is no sudden increase in net revenue to pay the dividends on the new share capital; and consequently, for a period more or less lengthy, the shareholders do not receive their maximum dividends, and all question of further payment of back-dividends to the original shareholders is indefinitely postponed.

Such a position as the one described above is well illustrated graphically by the diagram, which gives particulars of an actual case which occurred in the practice of the author. This shows, over a period of years, estimates of (1) population supplied; (2) consumption of water; (3) gross revenue; (4) working expenses; (5) net revenue; (6) capital expenditure; (7) sum required to pay maximum dividends.

From this it will be seen that although, in 1908, the company was paying maximum dividends and had a surplus at its command to pay off back-dividends, it was then in such a position that, in order to supply water to the estimated future population, it was necessary to expend additional capital in the years 1910, 1923, and 1931, which would so increase the share capital that maximum dividends could never again be paid until 1941.

Hitherto nothing has been said about the increased revenue derivable from the progressive increase of population; and this is a point which raises much controversy. In the case of a company paying maximum dividends, the shareholders clearly have no interest in future increase of population, except in so far as it may provide for the payment of back-dividends.

This, however, is not so in the case of a company which has not reached its maximum dividends, in whose district the population is increasing, and whose works are capable of supplying large quantities of water beyond present needs. In such a case it is argued that the shareholders are entitled to some payment for prospective increase in revenue; and this item is usually dealt with in one of two ways—either (*a*) by increasing the number of "years purchase" of the present revenue, or (*b*) by making an estimate of the probable future increase in revenue, and multiplying this by some smaller number of "years purchase"—smaller, because obviously the security of a prospective revenue cannot be the same as that of revenue actually derived from an existing population.

A further question sometimes arises in the case of a maximum dividend company, where the company has not issued its full share capital, but has issued some form of mortgage or debenture shares at a small fixed rate of interest—usually 4½ or 5 per cent. It is sometimes argued that the shareholders could, if they had been so minded, have issued further ordinary stock instead of debentures, and that, as such stock would have been entitled to the same rate of dividend as the ordinary shares, the company are entitled to be compensated on the basis that all share capital, whether debentures or otherwise, should be treated as capital bearing the maximum rate of dividend.

Payment of back-dividends is a subject upon which there is, as a rule, not much controversy. Assuming that a company is paying maximum dividends and has a large surplus, there is nothing to prevent it paying back-dividends; and it is merely a matter of calculation to ascertain the rate at which such dividends would be paid off, and what the present value of them may be.

In some cases water companies obtain an overdraft at their bankers, instead of issuing additional shares or debentures. Not infrequently works of considerable magnitude are carried out in this way; the intention being that the company should pay off the overdraft with the surplus income, and so avoid increasing the share capital. This method of conducting the business of a water company very often raises considerable difficulty in case of arbitration, as the additional works are usually producing an exceedingly small revenue—sometimes none; and consequently if dealt with by themselves as part of the undertaking, the revenue derived would not justify the capital expenditure. On the other hand, if the company had created additional share capital, the total revenue might be sufficient to pay the dividends; and hence the sum to be capitalized would be much larger than that representing the existing share capital. Under such circumstances, the usual course adopted is to treat the overdraft simply as a loan, and provide a sum of money to repay the loan. In other words, no profit is made on the overdraft. This is, of course, assuming that the capital expenditure has been properly applied to works useful to the company.

One of the features of the purchase of an undertaking is the fact that the local authority often step in to purchase at the time when the company are in Parliament for additional powers; and under such circumstances it is usual for the local authority to apply for what is known as the sterilizing clause to be inserted in the Bill. The effect of this sterilizing clause is that nothing in the Act shall authorize the company for the purpose of determination of the purchase price to be paid for the undertaking to bring into account, or make any claim in respect of, any powers, rights, or advantages conferred on them by, or resulting from, the passing of the Act. The contention in favour of such provision being included in the Act is that, as the company have not actually undertaken the construction of the additional works, they should not be entitled to any profit on the concession granted them by Parliament, which in many cases undoubtedly does convey to the company an element of value.

In addition to the actual value of the undertaking itself, it is usual to include in the purchasing Act a clause which requires the purchasing authority to take over any stock or materials such as coals, oil, spare pipes, &c.; and these are usually valued by some independent person between the two parties, and are not brought into the main arbitration. This is more convenient, because the quantities of stock cannot be ascertained until the day of transfer, and because the value is usually easily determined by vouchers which can be produced, and about which no controversy is likely to arise. The compensation of directors and the servants of the company, and the costs of obtaining or opposing Acts of Parliament are usually provided for in the Act; and the method of dealing with them is ordinarily there prescribed. These matters are highly important; but from an engineering point of view are subsidiary subjects, and hardly come within the scope of this communication, which is more particularly confined to the engineering features of water-works arbitrations.

In bringing this subject before the Institution, the author has necessarily treated it in general terms, and has endeavoured to indicate the principles on which compensation should be determined, rather than deal with details which must of necessity vary with every case.

The application of the principles to a particular undertaking must depend upon the attendant circumstances; and it is the duty of the valuer to present a case as favourable as possible to his clients. But at the same time, his valuation must be sound in principle if it is to successfully withstand the searching examination to which it is sure to be subjected.

DISASTERS TO RESERVOIR DAMS.

In the course of a lecture recently delivered for the Chadwick Trust, at the University of Birmingham, Mr. E. P. Hill dealt with the subject of the failure of reservoir dams. After referring to the disasters at Bilberry, near Huddersfield, in 1852, at Sheffield in 1864, and in America in 1889, 1900, and 1911, the lecturer expressed the opinion that the dangers that might attend the construction and maintenance of large reservoirs were not generally realized. He had lately been asked to report on an earthwork dam that was causing anxiety. The reservoir had been in existence for about twelve or thirteen years, and subsidence at a particular part of the embankment had occurred on more than one occasion. When he visited the work he found that a vertical hole 6 feet long and 4 feet wide had been formed in the top of the embankment, and that the earthwork had dropped vertically to a visible depth of 3 feet. When this sort of thing had occurred in the past, the official in charge had contented himself with tipping broken stone into the hole. The top of the puddle wall at this place had sunk to a level of only 8 inches above the normal water-level, and in other parts the puddle was only 2 inches above. In time of flood, the surface of the water in the reservoir stood 18 inches above the normal water-level, so that only the closeness of the earthwork prevented a terrible disaster. At the foot of the embankment there were springs of water evidently derived from the reservoir, and there was a deposit of puddle among the long grass. At the end of the discharge tunnel near the middle of the dam, water was freely entering, and there was on the bottom of the tunnel an accumulation of mud which appeared to be derived from the puddle. The puddle wall above this place showed a subsidence of 22 inches, though it was said that it had been restored on some previous occasion. The reservoir had a capacity of 242 million gallons, and the narrow valley below was densely populated for miles.

Gas and Electricity in Berlin.

It appears that statements have been published lately in the technical press and the daily press of Germany to the effect that the shrinkage in the gas consumption of Berlin can no longer be denied; such statements being made in the electric publicity columns. Fortunately the Gas Publicity Centre has taken up the matter, and gives some interesting figures with regard to it in the "Journal für Gasbeleuchtung" and "Wasser und Gas." The gas consumption of Berlin, it is stated, is increasing in a very regular manner, and the advance for 1912 was about 5·6 per cent., and as much as 7·5 per cent. for the first four months of 1913, as regards the municipal works only. The increase in consumers is greater than ever, 60,071 having been added in the year ending March 31 last. For comparison, it may be stated that the Berlin Electricity Works in December, 1912, only had 40,914 customers in all, so that the municipal gas-works gained more consumers in one year than there are consumers of electricity in the whole of Berlin. Gas-works managements are advised to make use of these remarkable figures in order to contradict the misstatements of electrical people.

We notice among the honours conferred by His Majesty on the occasion of the anniversary of his birthday that Sir Alfred Mond, Bart., M.P., of Messrs. Brunner, Mond, and Co., Limited, has been made a member of the Privy Council; and that a knighthood has been conferred upon Professor Schäfer, F.R.S., who was President of the British Association last year, and, it will be remembered, devoted his Inaugural Address to the subject of the origin of life.

INSTITUTION OF WATER ENGINEERS.

Summer General Meeting at Wakefield.

WAKEFIELD, the home of the incoming President, Mr. C. Clemesha Smith, M.Inst.C.E., was the scene of the eighteenth general summer meeting of the Institution of Water Engineers, which was held on Thursday, Friday, and Saturday of last week. As the following notes will show, there was much to see, and much to be done; and, as is usual with the meetings of the Institution, the proceedings arranged for the time at disposal were well divided between business and pleasure. Wakefield, with its historical associations, and its cathedral, has its attractions for the visitor. But the hotel accommodation is far from unlimited; and hence some of the members made Leeds their headquarters.

The business meetings were held in the handsome and well-appointed Council Chamber of the Town Hall, where, on Thursday morning, some fifty members were assembled at the opening proceedings, which were under the chairmanship of Mr. J. S. PICKERING, M.Inst.C.E., of Cheltenham (the outgoing President).

A CORDIAL WELCOME.

The DEPUTY-MAYOR (Councillor Marriott) said that he had in the first instance to apologize for the absence of the Mayor (Councillor E. Lodge Hirst, J.P.), who had been called away on important business connected with the town's welfare, and had asked him (the speaker) to take his place. He had on the previous day met his Worship, who had assured him that he was deeply sorry he could not be present to extend a cordial welcome to the Institution on their first official visit to Wakefield. He (the Deputy-Mayor) extended this welcome to them with pleasure and confidence, because he felt that in Wakefield they would find something to interest them. They had a water scheme of which they were duly proud. He might tell them that 25 years ago their chief source of supply was the River Calder; and those of them who knew the part from Todmorden to Wakefield, as it was at present, studded on both sides with innumerable sewage works, would have some idea of what the raw material was on which they had to work. By dint of very careful filtration and other methods, they were able to get something which looked like water; but he was bound to confess that water drinking in those days was somewhat at a discount. [Laughter.] To-day, they had a supply of excellent water, of the greatest purity. Indeed, he had seen a remark reported that their water "was the best in the world." This seemed rather a "tall order;" but he was not quite sure what was in the mind of the gentleman who made this statement. Perhaps he could not ask all those present to agree with the proposition that Wakefield water was the best in the world, as they no doubt had schemes of their own which had some pretensions to this description; but he would like to say that about five or six years ago the Corporation had from that eminent authority, Sir James Dewar, a report which contained the following sentence: "As regards bacteriological quality, the Wakefield water is of exceptional purity; and there are few towns in the United Kingdom that can command such a fine supply." He went on to say: "It is one of quite remarkable quality for all potable purposes." They were perfectly satisfied with such a report as this. He did not wish to boast too much about their water-works, but would like to say one word about their Engineer, Mr. C. Clemesha Smith. If he were to submit to them that, even if Wakefield had not the best water supply in the world, they had the best Water Engineer, he was sure they would all agree. [Applause.] Wakefield was proud of the distinction the Institution proposed to confer upon him that day—an honour which they believed was fully merited, for he was most capable, painstaking, courteous, and conscientious. He was sure Mr. Clemesha Smith would look after the members well during their visit to Wakefield, and they would be well entertained, and probably instructed. He cordially welcomed them, and hoped that they would have very pleasant recollections of the meeting.

Mr. PICKERING thanked Councillor Marriott on behalf of the Institution for the reception he had been good enough to give them. In his capacity of Deputy-Mayor of an important municipality, he would appreciate the advantages to water engineers of being able to attend gatherings of this character; and he would no doubt also agree that the benefit to be derived from such meetings was not only to the water engineers, but to the authorities they represented, and, through these authorities, to the community at large. It was essential to the education of a water engineer that he should not only make himself familiar with the works under his immediate control, but also that he should obtain a knowledge of the various schemes of water supply throughout the country. By these means, he was enabled to take advantage of the experience of others, and to advise his authority in a better manner on the important water supply questions which from time to time cropped up in his daily work. In placing the Council Chamber at the disposal of the Institution, and offering the members facilities for visiting the Wakefield Water-Works, the Corporation had conferred a privilege on them which they greatly appreciated. The pleasure they felt in visiting this ancient city was enhanced by the warm reception they had had. Judging from the admirable programme which had been arranged, and from the way everything had been thought-out for their comfort and convenience, he was sure the visit would be a pleasant and profitable one.

THE MINUTES.

The SECRETARY (Mr. Percy Griffith, M.Inst.C.E.) then read the minutes of the meetings held on Dec. 14 and Jan. 4 last, and they were confirmed.

PRESENTATION OF PREMIUMS.

Mr. PICKERING announced that the premiums awarded by the Council for papers presented during the past year were as follows: The President's premium, value £10, to Dr. Adolph Kemna, for his paper on "Recent Advances in the Science of Water Purification." Institution premiums of £5 to Mr. Donald Dinwiddy, for his paper on "Rates and Taxes on Water-Works Undertakings;" and to Mr. Arthur Valon, for his paper on the "Rating of Water Undertakings."

NEW MEMBERS, &c.

The SECRETARY then read the following names of members and associate members who had been elected or transferred since the last meeting.

Member.—Mr. T. M. Thomson, Engineer and Manager of the Tonbridge Water Company.

Associate Members.—Mr. A. W. Blakey and Mr. R. F. Chapman, of the Antofagasta and Bolivia Railway Company, Chili; Mr. H. J. Malins, of Blackpool; and Mr. D. M. Straughen, of Sunderland.

Transfer to Class of Member.—Mr. A. H. Jameson, Resident Water Engineer Thirlmere Aqueduct and Professor of Engineering at King's College, London.

THE NEW PRESIDENT.

Mr. PICKERING said it was now his pleasant duty to formally introduce to them the President for the ensuing twelve months. The honour they had done Mr. Clemesha Smith in electing him President was thoroughly well deserved; for he had taken a very active part in everything appertaining to the welfare of the Institution. He had given the Council the benefit of his judgment and advice for many years past, and was esteemed by all who knew him. He asked Mr. Clemesha Smith to accept a framed certificate, which was a record of his election to the office. Might the year be one of prosperity to the Institution and of good health and happiness to the President.

THE RETIRING PRESIDENT THANKED.

Mr. C. CLEMESHA SMITH (Wakefield) then took the chair amid applause, and thanked the members for the kind way in which they had received him, and for the certificate which he would treasure, and which those belonging to him would treasure, as a memento of the confidence which the Institution had displayed in him in electing him President. He was glad to have an opportunity of supplementing the welcome of the Deputy-Mayor, and trusted that the visit would be pleasant, and that they would at all events be able to gather something which would be of use to them in the future. It was a pleasure to propose a vote of thanks to the Retiring President, who had displayed all the qualities which went to make an admirable chairman—courtesy and tact, coupled with a jovial disposition and business capacity. Nothing could be better than the manner in which he had conducted the proceedings. He had spared himself neither time nor trouble to make everything go off smoothly, and to advance the interests of the Institution. His energy and foresight had enabled them to have an extremely pleasant time and a successful meeting at Cheltenham last year.

Mr. H. ASHTON HILL (Birmingham) seconded the proposition, which was cordially agreed to.

THE WORK OF THE INSTITUTION.

Mr. PICKERING, after acknowledging the vote, said that, in relinquishing the position which he had held for twelve months, he felt that he had been able to do very little personally to promote the objects of the Institution. At the same time, he could look back with considerable pleasure, thanks to the efforts of the Council, to great prosperity and activity in the Institution, and a continued usefulness. It was satisfactory that the financial aspect of the Institution had now been put on a very substantial basis. Owing to their energies during the last few years in promoting matters connected with water supply, they had somewhat overstepped the means at their disposal. Fortunately, however, they were now in a much better position, and their revenue was far in excess of any ordinary requirements. No doubt they would be glad to know that the increase of subscriptions, in which they acquiesced a year ago, had not been the means of diminishing the membership in any appreciable way. On the contrary, he thought

at the end of the twelve months they would have a substantial increase in the roll, which was very gratifying. One little innovation had been made in his year of office—namely, holding an additional meeting; and those members who attended the instructive visit to the Cardiff Water-Works would, he felt sure, be convinced that the step then taken was for the benefit of the members. He hoped such meetings would be continued.

The Late Mr. Easton Devonshire.

Mr. Pickering (continuing) said there was one sorrowful matter he had to record—the loss the Institution had sustained by the death of their colleague and friend Mr. Easton Devonshire, who was a man of sterling qualities. His wide experience and his thorough business capacity enabled him to do a great deal in promoting the interests of the Institution. Those who were familiar with his activity and his devotion in every way to the Institution would feel that his loss was practically irreparable; and it was with very great regret that he referred to his untimely death.

INAUGURAL ADDRESS.

The President then proceeded to deliver his Inaugural Address. He dealt first with the work of the Institution, and pointed out that the total number of members, &c., had increased during the past ten years by 40 per cent. The Institution, he said, had now completed its first year as a corporate body; and it seemed more than probable that, under the fuller powers now possessed, its activity would be increased, and its sphere of usefulness enlarged. As the result of a discussion at the Cheltenham meeting, on the desirability of standardizing "General Conditions of Contracts," a Sub-Committee were now drafting a set of conditions for submission to the Council. No definite course of action could be indicated until the draft had been discussed; but he had hopes that the Council would at the winter meeting be able to report substantial progress towards the end in view. From the circular recently issued by the Council on the subject of the "Valuation of Land acquired for Water-Works," it would be seen that the Council were fully alive to the interests of members on public questions of this kind, and were prepared to take the necessary steps so as to protect the interests of water undertakings whenever opportunity offered. The President then proceeded as follows.

Co-ordination of Experimental Work.

Thinking over what has been achieved, has led me to consider in what manner the utility of the Institution might be increased. I have long thought—and, indeed, it must be obvious to all who reflect upon the subject—that a great mass of experimental work is lost to the community because the results in many cases are not properly recorded; and even when complete records are kept, the results remain with the investigator. Further, it seems clear to me that the value of experimental research would be greatly increased if the experiments were made under a variety of conditions and by different persons, because a comparative analysis of the results so obtained would reveal truths which are lost sight of when the experiments are made without such systematic co-ordination. It therefore occurs to me to ask whether it is possible to make this Institution a "clearing house" for the handling of some at least of the many problems to which we devote time and thought. Let me illustrate my point with an example.

I do not think that anyone who has had experience in the distribution of water will venture to say that the pipes now in use can be looked upon as having reached perfection. We are constantly faced with difficulties arising from the reduction of the carrying capacity of our mains by incrustations of various kinds. Pipes which have been laid for periods as long as eighty or ninety years are found to be affected by internal incrustation and by internal and external corrosion. Would not more complete information as to the composition and methods of manufacture of these old pipes, as well as a specification of the coating applied, be of considerable value? It should not be difficult to arrive at some standard method of keeping records of the chemical composition of the iron and of the coating, of the method of manufacture of the iron and application of the coating, together with analyses of the water conveyed, and sundry other data. If such records were kept by a large number of our members, and if certain mains in each town or district were examined at stated periods—portions being cut out and kept for reference—it would be possible to collate the information so obtained, and throw considerable light on a common, but none the less important, problem.

The multiplication of observers and observations, and the variation in the conditions under which the pipes were used, would enhance the value of the records; and the latter would not be lost sight of, as are those obtained by individual observers. If this idea could be adopted in the case of this and other like problems, I feel sure the beneficial results would be apparent to both water engineers and consumers of water.

Methods of Purification Adopted at Wakefield.

With your permission, I will now direct your attention to two phases of our local water question which I think may be of general interest. The first is in connection with the purification of water as practised by the Water-Works Company which supplied Wakefield from 1839 to 1879.

Water was drawn from the River Calder, at a point a mile-and-a-half below the city, and was at first considered to be pure enough for use without filtration. Subsequently (about the year 1850), sand filter-beds were constructed. But by the year 1860 the rapidly increasing pollution of the river (due to the growth of manufacturing towns and villages) rendered additional means of purification necessary. The water was described as being "as black as ink;" and a few years later a letter written in the water of the Calder was put in as evidence before a Committee of the House of Commons. In the year 1863, a filter-bed (the first of a series of four) was constructed, embodying a process recommended by Mr. Thomas Spencer. This filter-bed consisted of a layer of 1 foot of gravel under 2 ft. 6 in. of sand; and in the sand, about 12 inches below the surface, a layer of 12 inches of material described as "Spencer's Magnetic Carbide of Iron" was placed. Mr. Spencer described this material as consisting of protoxide of iron in chemical combination with carbon, and said that it was "produced by keeping hæmatite for twelve or sixteen hours at a certain red heat in contact with carbonaceous matter." According to Mr. Spencer's instructions, one bed was to be allowed to lie fallow while the other three were in use. The beds were cleaned in the ordinary manner; the carbide of iron never being touched, or even uncovered. The rate of filtration adopted was 600 gallons per square yard per day, or $5\frac{1}{3}$ inches per hour. Mr. Spencer laid stress on the necessity of carrying on filtering operations intermittently; and, speaking of the effect of his magnetic carbide, before a Committee of the House of Lords in 1870, he made the following statement: "It [the magnetic carbide] acts combustively upon the organic matter which is held in solution in the water—the matter in suspension being previously intercepted, so that all the organic matter in solution can be taken out." Incidentally, I might mention that Mr. Spencer proposed to adapt his filter-beds for the treatment of sewage, and stated that, in his opinion, precipitation combined with subsequent filtration would be better than irrigation.

I have been unable to obtain a complete analysis of the water supplied in Wakefield after it had passed through the double set of filters; but I discovered a partial one which stated that no trace of organic matter remained. The Medical Officer of Health for Wakefield of that day gave evidence that, after the installation of the system, a remarkable reduction of epidemic disease took place; and during the cholera epidemic of 1866 only one case occurred in the town, and that proved to be imported.

Mr. T. Netten Radcliffe, in a report to the Local Government Board dated 1869, on the sanitary administration of Wakefield, described the condition of the water at the intake from the Calder as having "a black opaque appearance," and stated that the banks were covered with a black, slimy mud. He goes on to say: "The change which the aspect of the water undergoes in the subsidence reservoirs (capacity two-months' storage) is remarkable." After the water had been passed through the preliminary sand-filters and Mr. Spencer's sand and "magnetic carbide" filters, he says that "the water is almost uniformly bright, clear, and well-tasted." It is only proper to add that, while expressing a certain admiration for the results obtained, Mr. Radcliffe disapproved of the policy of continuing to draw water from such a foul source.

I have referred to this matter at some length, in order to call attention to the use which was made some fifty years ago of subsiding reservoirs, preliminary sand-filtration and secondary sand-filtration, combined with the use of an oxidizing substance in the purification of an exceedingly bad water. Notwithstanding the measure of success achieved by this system, neither the Water Company nor the Corporation was content to continue the use of water from such a source; and for over twenty years attempts were made to obtain a purer supply, which, however, was not secured until the year 1888.

Plumbo-solvent Action of Water and its Prevention.

The second local matter which I take this opportunity of referring to is the treatment rendered necessary by the plumbo-solvent action of the water. The present supply is obtained from peat-covered moorlands at Rishworth, on the Pennine Chain. The raw water has a strong action upon lead; being capable of taking up from 1 to $2\frac{1}{2}$ grains of lead per gallon in twelve hours. When this supply was first used, it was not filtered, but was decanted and delivered direct to the town. On the advice of Dr. Percy Frankland, treatment was commenced in 1892; carbonate of soda being added at the rate of $3\frac{1}{2}$ grains per gallon. Dr. Frankland advised this treatment for temporary use only, and suggested the use of lime and chalk as a more permanent measure. The soda treatment was efficient, though costly; averaging 21s. per million gallons. As it was found desirable to filter the water in order to remove a clay stain which at times made its appearance, the question of treatment to neutralize acidity was considered in 1898 together with that of filtration. At that time, it was generally understood that filtration through sand was sufficient to prevent plumbo-solvency; but in order to gain accurate information, I carried out a series of experiments.

From these, I found that filtration through River Ouse and River Trent sands was, at the outset, as efficient as the soda treatment in neutralizing the acidity. But after constantly filtering the water at the rate of 4 inches per hour, through the same sample of Trent Sand for three months, the filtered water was capable of dissolving lead to the extent of 0·35 grain per gallon in twelve hours, when placed within a sealed lead pipe—the unfiltered water being capable of taking up 1·30 grains under the same circumstances. Water filtered through a fresh sample of Leighton Buzzard sand had its affinity for lead reduced so that it took up 0·42 grain per gallon; the raw water dissolving 1·10 grains per gallon. At the end of two months' constant use, the water filtered

through this sand still took up 0·42 grain per gallon. Laboratory experiments showed that if a turbid, peaty water were allowed to stand until it was partially clear, or if it were passed through filter-papers, the plumbo-solvent action was reduced. It was inferred that the action of the Leighton Buzzard sand, as regards the reduction of plumbo-solvent action, was mechanical, and that the action of the Trent and Ouse sands was at the outset chemical and mechanical; the chemical action being reduced as the neutralizing substance was gradually eliminated from the sand. It was obvious that some treatment would be necessary in addition to filtration; and as the result of a long series of experiments, the water is now treated with about 1½ grains of carbonate of lime per gallon before filtration, and 1½ grains of quicklime per gallon (in the form of a clear solution of lime water) after filtration.

The addition of lime-water after filtration is due to a circumstance which I have not seen noted elsewhere. Wakefield water, when treated with lime and chalk, must be rendered definitely alkaline in order that it may not take up lead. It was found that, though the alkalinity of the water might be raised to such a point as to preclude plumbo-solvent action, in passing through the filter-bed the alkalinity was reduced to below the safety limit. This reduction in alkalinity was not due to the removal of lime and chalk in suspension, since there was no loss when the water was passed through many filter-papers. As far back as 1888, Mr. W. H. Power suggested that the plumbo-solvent action of soft moorland waters might be related to the agency (direct or indirect) of low forms of inorganic life. Dr. Houston, in the second of his able reports on this subject to the Local Government Board dated 1901-2, makes the following statement: "While in moorland waters the cause of plumbo-solvency is to be traced to the presence of acid in the water, and the source of the acid to contact with the peat, the antecedent cause of the acidity seems to be associated, at all events in part, with the presence of acid-producing bacteria in the peat itself." It appears probable that at some seasons, if not at all times, these acid-producing bacteria lying in the film on the sand are responsible for partially neutralizing the alkalinity previously imparted to the water.

The cost of treating the water with 1½ grains each of carbonate of lime and quicklime is from 3s. 6d. to 4s. per million gallons, against a cost of 21s. per million for the soda process. The carbonate of lime has been largely obtained from the Stockport Corporation; it being a waste product from their softening-works at Wilmslow. This was, I believe, the first instance of the use of carbonate from a softening plant for the reverse process—"hardening."

CONTROL AND ALLOCATION OF SOURCES OF SUPPLY.

I now turn to a subject of wider interest—namely, the control and allocation of sources of supply. Much has been spoken and written on this subject; but I will only briefly recapitulate one or two of the recommendations already made. The fifth report of the Royal Commission on Sewage Disposal, in dealing with the question of pollution of surface water, suggests the formation of a central administrative authority and of local rivers boards, and that their duties should include the protection of water supplies from pollution, and the collection of information as to available supplies, and also as to the need for water in the various parts of the country. The Joint Committee on the Water Supplies Protection Bill, 1910, re-asserted and emphasized the above recommendations; and in November, 1910, the House of Commons ordered a return to be made giving various particulars of water undertakings in every district in England and Wales, the results of which have not yet been published.

The Water Areas and Statistics Committee of our own Institution issued a report on this subject in November, 1911, expressing general agreement as to the necessity for the creation of a central authority and local representative boards to deal with questions of water supply—such boards to be composed of experts in engineering, geology, chemistry, bacteriology, and any other sciences bearing on the subject. In the opinion of the Committee, it is advisable that such boards should be independent of authorities interested in the local undertakings, and that they should be charged with the duty of collecting and collating information as to existing works, areas of supply, and possible sources from which water may be obtained—making reports to the Central Board; the latter being called upon to advise Parliament as to any scheme brought before it.

These recommendations have, I believe, the approval of the majority of those interested in the subject. The time has arrived when it is necessary that the fullest possible information as to our national supply should be carefully collected and considered by competent men, so that all questions relating to the protection and allocation of surface and underground waters may be dealt with in the light of the best available knowledge and on the broadest possible lines, having in view the interests of the community as a whole, rather than by the present method of piecemeal legislation, which often results in a conflict of interests of neighbouring communities and in unnecessary expenditure in order to defend them.

Cautious people may ask, What will be the result of the formation of the suggested boards? Is the tendency towards Government ownership? It may be so. But the difficulties are great; and if it comes at all, it will, I think, be the final stage in an evolutionary process. The phase which we are approaching will, I believe, be the division of the country into areas supplied by water boards. The areas will in most cases be much larger than many of the existing units of supply. In laying out the limits of such areas, it is of primary importance that the position and yield of all available sources, as well as the present and future requirements of the inhabitants, should receive careful consideration. Up to the present time, the needs and resources of the country have not been considered from the point of view of the community at large. In many cases, it has been found desirable to form joint boards, or in some way to combine two or more districts in one area of supply; the arbitrary boundaries of municipal corporations or other local bodies rarely being ideal limits for the supply of water.

The financial advantages of combination are great. Not only are expensive parliamentary contests avoided, but it may be almost universally assumed that large works are cheaper to construct than small ones. Another way in which economy can be secured by combination may be illustrated by a hypothetical case of three neighbouring towns, each about to construct a reservoir at a cost of £100,000; the yield in each case being estimated to provide for (say) the next 21 years. The total capital expenditure will be £300,000; and the total annual charges, including sinking fund and interest, will amount to about £15,000, or £315,000 in 21 years. Providing the physical conditions are such that the supplies are interchangeable, it would not be necessary, if the three towns combined, to construct the three reservoirs at once. The first only would be made immediately, the second at the end of seven years, and the third at the end of fourteen years. The annual charges for the first seven years would be reduced by £10,000, and for the next seven years by £5000—a total saving of £105,000 to the present generation. This case is, of course, hypothetical; but it would not be difficult to find parallel ones in actual practice.

In existing cases where supplies are used jointly, the financial arrangements between the several parties vary considerably, each method having its own peculiar advantages and disadvantages. The following are the principal methods adopted.

(1) The construction of works by one corporation; water being subsequently sold in bulk to other administrative bodies. Here an attempt is made to render the supply of water merely a commercial transaction between the promoting authority and the others interested; and as the ordinary rules of supply and demand cannot apply, it is possible that one or other of the parties may ultimately find that the bargain is not satisfactory. If the prices to be charged for the supplies have been fixed before the works were completed, the agreed price of the water may bear no relation to the actual cost, and one side or the other will suffer. If the agreement be perpetual, and no provision is made for a revision of price, a rise or fall in cost of water places one or other party at a disadvantage. On the other hand, the insecurity of terminable agreements is a weighty argument against them.

(2) The construction of works by one authority; water being supplied directly to the inhabitants of other districts—the water-rents in the latter being usually higher than those charged within the area of the constructing authority. Here the burden is unequally borne; the consumers in the outside districts assisting to pay off the debt on an undertaking in the ownership of which they will not ultimately share. On the other hand, if a heavy deficit occurs, as is sometimes the case, even when the rates charged are at the maximum, the ratepayers within the area of the owning authority will be called upon to make good the deficit.

(3) The construction of works by a joint board in which all the districts supplied participate; the water being delivered in bulk to each separate partner, the proportional payments to be made being determined prior to the supply being given. This method has advantages over those described above; each of the districts being ensured a supply at cost price. In cases where the needs of all the districts grow at the same rate, this arrangement is satisfactory. It will commonly be found, however, that the ratio of increase in demand will vary considerably, and frequent adjustments of the maximum quantities which may be drawn, and the individual liability of each district, will be necessary.

(4) The construction of works by a joint board; water being supplied directly by the board to all the inhabitants of the several districts on a uniform scale of charges. The main argument against this scheme is that, though the consumers in all districts pay on the same scale, the cost per 1000 gallons delivered may vary. This objection applies in a greater or lesser degree to all existing cases where a common scale is in force; and it would be necessary to have this point in view when defining the area of supply. Nevertheless, this method appears to be the best so far devised. The grave disadvantages incidental to terminable agreements are avoided; the cost of the supply is borne by all who have the use of it; and the whole of the consumers are assured of water for all time up to the capacity of the source or sources of supply.

[In order to illustrate the manner in which available sources are being appropriated, the interdependence of towns and rural areas, and the arbitrary limits of the areas supplied in the more densely populated areas, the President had prepared two plans of the Calder Valley. The first showed the catchment areas appropriated for public supply and other purposes; and on this he had also indicated the areas still unappropriated. The second showed the areas supplied by eight authorities who share the duty of supplying practically the whole valley.]

The Calder Valley has an area of 236,160 acres, or 369 square miles. The lower half is on the coal measures, the upper half on the millstone grits. The population in the year 1911 was 735,000,

mostly engaged in industrial pursuits; the chief occupations being coal mining, engineering, and the manufacture of heavy woollen goods. The upper reaches of the Calder and its most important tributaries drain the moorlands and uplands of the Pennine Chain. The water is naturally soft, and its characteristics render it not only of service as a supply for domestic use, but also invaluable for many of the processes of the woollen trade. The catchment areas from which a pure supply of water is to be obtained have already been for the most part appropriated. The main authorities concerned in the supply of water are the county boroughs of Bradford, Huddersfield, Halifax, and Dewsbury, and the boroughs of Wakefield, Batley, Morley, and Todmorden. Of these, Bradford and Dewsbury obtain their water from catchment areas outside the valley; only a small portion of the borough of Bradford and its area of supply are within the Calder watershed; but Dewsbury and its area of supply are entirely within its limits.

Population within valley supplied from catchment grounds within valley	568,000
Population outside valley supplied from catchment grounds within valley	74,000
Total population supplied from upper reaches of the Calder	642,000
Population in Calder Valley supplied from small works, wells, and springs	29,000
Population within Calder Valley supplied from outside the valley	138,000

The acreage of the catchment areas appropriated and unappropriated are shown below:—

—	Acres.	Approximate Yield for Supply.	Quantity Required at Present.	Quantity Available for Future Increase.
		Million Gallons per Day.	Million Gallons per Day.	Million Gallons per Day.
Appropriated for public water supplies	21,077	21	16	5
Unappropriated	11,993	12	—	12
	33,070	33	16	17
Appropriated for use of canals and millowners	11,744			

It would appear that there are still some 17 million gallons per day available; but this is on the assumption that it will be possible to utilize the whole of the unappropriated catchment areas. It must, however, be remembered, that during the past fifty years the best reservoir sites and gathering grounds have been selected for use. Of those remaining, a superficial investigation leads to the conclusion that in some cases the cost of the necessary works would probably be quite disproportionate to the quantity of water to be obtained. On these and other grounds, it is advisable to reduce the available yield to 13 million gallons per day. With the information at present obtainable, I estimate that this quantity will, at the present rate of consumption, provide for the next fifty years. A forecast made for such a period may easily be vitiated by an increase in the quantity of water required for sanitary purposes, or by alterations in the commercial processes of the district. The general tendency is for the consumption of water per head (apart from waste) to increase. Hence it is possible that the resources of the watershed may be exhausted within thirty or forty years.

Now, forty or even fifty years is a very short period when considering the needs of a large community. It is obvious, therefore, that in this case it is prudent to suggest, not only a careful examination of the upland sources of supply, but also of all possible means of providing water from surface and underground sources within and without the watershed. It is true that there is a considerable body of water in the coal measures; but apart from the disturbance and possible pollution caused by mining, the character of the water is variable, and it is often unsuitable for domestic, and even trade, uses. Through the kindness of Dr. M'Lean Wilson, Chief Inspector of the West Riding Rivers Board, and Dr. E. M. Chaplin, City Analyst, Wakefield, I have inspected the analyses of nearly a hundred samples of water from collieries, &c., in this neighbourhood. The water is often saline. The total solids are usually high—in many instances upwards of 100 grains per gallon, and in one case over 2000 grains per gallon (largely sodium chloride). The hardness is often high, ranging in a large number of cases from 30° to 60°, and in one instance running up to over 400°. In a few cases water from the coal measures is used for trade purposes; but it requires softening before it can be applied to many of the local industries, and is liable to fluctuate in quality.

The boundaries of the areas supplied have not in all cases been formed on well-defined principles. The present situation is the outcome of competition, compromise, and sporadic growth. The trunk-mains cross and re-cross one another; and in one instance three such mains, owned by different authorities, are laid side-by-side in the highway for a considerable distance. A study of the two maps will, I believe, make clear the possibilities in the direction of co-operation and co-ordination, and will lead to the conclusion that such co-operation will be necessary before the resources of the watershed can be fully developed on the most economical lines to the general advantage of the inhabitants.

I have ventured to bring these facts and figures before you because I believe that, slight as they are, they afford better evidence than general statements or expressions of opinion as to the necessity for the adoption of some scheme whereby full and complete information as to the country's water supply may be obtained and properly considered. It is, I think, obvious that a central board in possession of this information would not only be in a position to advise as to the desirability of schemes before Parliament, but would be able to indicate broadly the lines of development which would make for the economical conservation and distribution of this prime necessity of life in any particular area.

Mr. C. H. Priestley (Cardiff) proposed a hearty vote of thanks to the President for his address, which, he remarked, was only a foretaste of what Mr. Clemesha Smith would do for them during his year of office.

Mr. Robert Askwith (Bishop Auckland) seconded the proposal, which was carried with acclamation, and acknowledged by the President.

A LECTURE.

The President remarked that Professor Kendall, of Leeds University, would now give them a lecture. The lecture, as originally announced, was to be on the "Underground Waters of the Lower Calder;" but owing to circumstances over which he had no control, the Professor was not able at present to deliver this lecture. He would, however, give them some information with regard to water undertakings in this community.

Professor Percy F. Kendall, F.G.S., then gave his lecture—in the first place apologizing for his inability to follow the programme. He explained that when he was invited to attend and address the meeting, he was obliged to attach a condition to his acceptance. It would no doubt be within the knowledge of many of those present that there were several new water undertakings under consideration in the area of the Calder Valley. As some of these schemes had not reached a condition of maturity, but were emerging from the embryonic stage, he was debarred by considerations of propriety and delicacy from discussing anything that would have a direct bearing upon them; so that in anything he had to say, he would refrain from going into details of locality. He wanted, however, to briefly indicate what was the general character of the water supplies derived from underground sources in the region of Yorkshire which included the Calder Valley; and those who chose to apply the principles enunciated to this area were at liberty to do so.

The underground water sources of the portion of Yorkshire with which he was dealing were derived from four sets of strata. He would first take the Millstone Grit. This was a very coarse sandstone, which at the outcrop was not only coarse but very open in texture, encouraging high expectations of its water-yielding capacity which were not always realized. Bitter disappointment frequently arose. He had met with cases in which cores from the Millstone Grit had really, from superficial inspection, very much the appearance of granite; and, in this event, it was necessary to rely for water on the joints in the rock, and not on the porosity of the rock itself. It would be interesting to ascertain what the percentage of porosity actually was; and this, he hoped, would now be accomplished before very long.

As to the quality of Millstone Grit water, it was usually very soft, and admirable in all other respects; but within recent experience he had met with cases of very soft water and very hard water being drawn, from the same source, from borings within a quarter of a mile of each other. This anomaly occurred in the neighbourhood of a great pair of trough-faults; and he thought that the difference of composition might be due to flow of water from different members of the Coal Measures having acted as conduits conveying water across the gap.

Turning next to the Coal Measures, which constituted the area of the lower course of the Aire, Calder, and other rivers down below Sheffield, the water from these measures in like manner varied a good deal. They had very soft water from certain portions, and very hard water from others, besides water that, without being unduly hard, was extraordinarily alkaline. Now, the areas within which the coal-measure waters were found sometimes demanded one type of water and sometimes another. For wool-washing, the highly alkaline waters were greatly esteemed. In one of the cases which he had had under investigation recently, the water was pronounced to be an exceedingly good one for certain purposes, but not for the object for which it was required. It was pointed out that it would be excellent for mineral water manufacture, as it would. The hardness might arise from various ingredients. Frequently there was a great deal of permanent hardness, and often common salt—which was not really hardness.

The third source—he was taking them in their regular geological and geographical sequence—was the Magnesian Limestone. This water was generally very hard, which rendered it undesirable for many purposes. There was abundant water in the Magnesian Limestone—in fact, too much, not perhaps from the point of view of the water engineers, but from that of the mining engineers, who mostly encountered it. Great developments in the Yorkshire coalfield were now taking place through the Magnesian Limestone; and difficulties with water had been met with

which almost threatened to be an absolute bar to mining enterprise in parts of this region. The water had to be pumped in very large volumes, and this had produced grave and far-reaching effects upon neighbouring domestic small-scale water supplies.

The last rocks that could be considered as coming within the area under review were the red sandstones of the Trias. Provided the conditions were favourable, these sandstones afforded admirable supplies. It was a water of unexceptionable purity, and not very hard. But they were under two severe limitations. In the first place, there must be such a thickness of rock as would afford a reasonable depth for the well. This compelled them to go far to the east. If, however, they went too far to the east, deterioration set in, which became more and more pronounced, until at last the water was undrinkable. It was remarkable that there should be, as there sometimes was, a very abrupt line; but generally the deterioration was a gradual one.

Relating, by the aid of a blackboard, some of the different noteworthy cases he had come across, the Professor said that his experience of water supplies, whether from gravitation or from underground sources, was rather like a medical man's experience of human physiology—he was called in to the sick man, and not to the one in good health. In the same way his own experience had embraced a larger number of other people's failures than of their successes. One instance he recalled was of a borehole that passed through 400 feet or so of Coal Measures into the top bed of the Millstone Grit, and which was yielding no appreciable supply of water. They were boring between the top bed of grit and the second one when his advice was asked; and he saw that if this top bed of grit failed to yield a source of water supply, it was exceedingly improbable that the next one would be any better. He therefore proposed an expedient that was well known to water engineers. The trouble was that the Millstone Grit through which they passed was far too dense, and, being practically free from joints, the rocks were almost impervious; and the only hope of obtaining a supply of water would be by the development of fissures which would permit of the passing of water.

Consequently, he proposed that shots should be fired, with a high explosive, having local effect, with a view to the opening-up of fissures from the borehole into the actual joint fissures of the rock, and indicated the levels at which he thought it was desirable that this should be done. It was not required in this particular case to obtain soft water, but hard water—and the harder the better. The level he favoured most was about 600 feet; but he proposed that they should commence at the bottom of the borehole, in the Millstone Grit—firing a heavy charge there, and withdrawing the lining tubes progressively, repeating the operation at several indicated levels, finishing at 400 feet. When they obtained the quantity and quality of water they desired, they could suspend operations, and shut out the soft water, if it interfered with the supply. The well-sinker engaged wrote to him to say that their first charge had been successful. He (the Professor) recommended heavy charges of gelignite—about 35 lbs. This seemed rather ambitious, perhaps; but in the case referred to a single 2 lb. charge of dynamite sufficed. It exploded prematurely at 400 feet, and an ample supply of water resulted. It was an eminently successful result; and he thought it could not be too widely known that the cause he had alluded to was a common reason for the failure of deep boreholes—he meant the density of the rock and the rarity of fissures of a suitable character.

He had recommended a similar course of action in a case at Huddersfield; but it was not carried out, for the reason that the borehole was within a large warehouse in a populous area, and it was feared that serious consequences might ensue. Upon this point, he could give some further specific information as to the effect of a charge on a deep borehole. He had had two 35 lb. charges of gelignite fired at 400 feet in a borehole, and the only result was to lift a column of water about 80 feet. The water stood about 300 feet above the point at which the shot was fired; and this column was lifted 80 feet—no effect being produced on the surface. Thus, it was with great confidence, under similar conditions in regard to depth of water, he recommended the firing of a shot, even within a building.

One last illustration he would mention, not for its local interest, but because it was the most notable instance of a true artesian water supply that he had encountered in Yorkshire. The locality was Oswaldkirk, in the neighbourhood of Malton. The strata were the Corallian limestones and sandstones, underlain by the Oxford Clay, which rested on the Kellaways Rock. The last-named formation outcropped at a high level on the Hambleton escarpment, and dipped down below the Oxford Clay at Oswaldkirk. He was led to expect that this would yield an artesian supply, and recommended a boring for this specific purpose. The result confirmed this anticipation, and at 316 feet the Kellaways Rock was pierced, when the water rose under a pressure sufficient to lift it 92 feet above the surface of the ground. The yield at ground-level is nearly 200,000 gallons per diem, as determined by Mr. E. J. Silcock, who was in charge of the work.

In conclusion, Professor Kendall referred to his discursive treatment of a very large subject, and asked the members to make generous allowance for the difficulties of his position.

The PRESIDENT, in proposing a hearty vote of thanks to the Professor, said they had listened with deep interest to the lecture. With regard to the remarks made about the millstone grit, several of the Wakefield reservoirs were on this grit; and they did find on one occasion that the lower beds of the Millstone Grit were extremely dense—so much so, in fact, that the reservoir was bottomed on very close millstone grit.

Mr. T. MOLYNEUX (Stockport), in seconding, said he had found the differences mentioned in adjacent boreholes. He had sunk a borehole within 20 yards of another; and in the old borehole there was an iron solution, while in the new one there was nothing of the sort, but a bright clear water, 2° less in hardness, and with no permanent hardness.

The vote was cordially passed; and Professor KENDALL briefly acknowledged it.

VALUATION OF WATER UNDERTAKINGS ON TRANSFER.

Mr. E. J. SILCOCK, M.Inst.C.E. (Leeds), then read his paper on the "Valuation of Water Undertakings on Transfer to Local Authorities," which was unavoidably postponed from the winter meeting of the Institution. The paper will be found on p. 736. of this number; and a report of the interesting discussion to which it gave rise will be published next week.

ARDSLEY RESERVOIR AND FILTRATION WORKS.

The business above recorded completed the sitting on Thursday morning; and after lunch the members were conveyed in motor-brakes to the Kirkhamgate filtration works of the Wakefield Corporation. After an inspection of these, the brakes were again requisitioned to take the party on to the Ardsley reservoir. It is unnecessary to give any particulars of these works here, in view of the printed information prepared for the meeting by Mr. Clemesha Smith, which is reproduced elsewhere. It must, however, be mentioned that while at Ardsley the visitors were the guests of the President and his wife at tea. This proved to be a delightful little function, on the banks of the reservoir; the weather at the time being kind. After being photographed, the party left the reservoir, but not the water; for the return to Wakefield in the brakes was made through a thunderstorm. When at Ardsley, Mr. and Mrs. Clemesha Smith were warmly thanked for their hospitality, on the proposition of Mr. Molyneux, seconded by Mr. F. W. M'Cullough.

OTHER ENGAGEMENTS.

In the evening, there was a reception at the Town Hall; and the programme for Friday consisted of an inspection of the Green Withens and Ringstone reservoirs and the works at Brighouse of Messrs. Blakeborough and Sons. The visitors were entertained to luncheon, by the Wakefield Corporation Water Committee, at Ringstone, and to tea at Messrs. Blakeborough's.

ANNUAL DINNER.

Returning to Wakefield, there was another engagement awaiting the members—the annual dinner, which was held in the Banquet Chamber of the Town Hall.

The PRESIDENT occupied the chair.

Mr. ROBERT ASKWITH, in giving the toast of "The Mayor and Corporation of Wakefield," said that, while they were sorry the Mayor was not able to be present and welcome the Institution on the opening day, they were charmed by the real Yorkshire welcome which was accorded to them by the Deputy-Mayor.

The MAYOR, in response, expressed the pleasure it had given the Corporation to receive the Institution at Wakefield, especially as the members had conferred the presidency upon their Water Engineer, Mr. Clemesha Smith. They realized that in Mr. Smith, Wakefield had an official who was well worthy of the honour the Institution had bestowed upon him.

Councillor FOSTER, in proposing the toast of "The Institution of Water Engineers," remarked that they in Wakefield felt that the Institution had conferred a great honour upon the Mayor and Corporation and the city in coming among them for the annual conference. The Institution was an important body; the work the members did being essential to the life and well-being of the millions of inhabitants of this country. The Institution contained engineers acting under companies and corporations controlling works supplying with water over 22 million inhabitants of this country. Water was one of the prime necessities of life; and they recognized that the members of such an Institution were engaged in work which deserved the recognition of all corporations and authorities who had the health and well-being of the community under their control. It had been his privilege to represent the Wakefield Corporation at the Institution's gatherings at York and Cheltenham; and as a member of the Water Committee, he was convinced that he had thereby gained much useful information which was for the benefit of the citizens of Wakefield. Nothing was more important than procuring and maintaining a plentiful supply of pure water. From the progress the Institution had already made, he felt sure there was a promising future ahead. The visit the members had paid to the Corporation's reservoirs had, he hoped, proved not uninteresting under the guidance of the President.

The PRESIDENT, in responding, referred to the great advantage to be obtained from institutions of this nature, where the members could meet and discuss with one another the many important problems which came before them from time to time. If it was necessary for the Institution to have a motto, he would suggest that they adopt the words of Bacon—"Reading makes a full man, writing an exact man, but conference a ready man." He asked the younger members more especially to practise putting their thoughts into writing through the medium of papers to be read before their fellow members. Such work, he said, would not be a bad education for those who performed it; and it would be marvellously helpful to others. He wished to thank the members for the very kind way in which they had received him at the beginning of his presidential year. He had had many kindnesses from the members since he first came among them seven or

eight years ago at Bolton. At that time, he did not know a single face, whereas now he had friends in almost every part of the country. He also thanked the Mayor and Corporation and citizens of Wakefield for the way in which they had dealt with him since he had been with them. When he first came to the city as their Water Engineer, the drinking water was of a very dark colour, owing to a clay stain at one of their reservoirs. He was nervous of walking through the streets, as he used to be accosted with the question, "When are you going to give us something we can drink." [Laughter,] He was pleased to say that, with the assistance of eminent engineers and other scientists, backed-up by the members of the Water Committee, they had altered all this, and Wakefield now possessed a water which could be drunk with impunity.

Mr. T. Molyneux proposed "The Visitors;" the toast being responded to by Alderman Hudson and Mr. Keay.

Saturday's Business.

On Saturday morning, the business meeting was resumed in the Council Chamber; the papers remaining to be read and discussed being as follows:—

"Reservoir Storage in Relation to Stream Flow," by Mr. W. J. E. Binnie, M.Inst.C.E., B.A. Cantab., F.G.S., and Dr. Herbert Lapworth, M.Inst.C.E., F.G.S.

"The Water Supply of Jersey," by Mr. Alfred J. Jenkins, Assoc.M.Inst.C.E.

"Animal Growths in Water-Pipes," by Mr. Samuel C. Chapman, M.Inst.C.E.

Wakefield Sewage-Works.

An invitation was extended by the City Engineer (Mr. J. P. Wakeford) to those members who might wish to do so to visit the Wakefield Sewage-Works (where some interesting operations were in progress) on Saturday afternoon.

WAKEFIELD CORPORATION WATER-WORKS.

In view of the meeting and visits, some notes had been prepared by Mr. Clemesha Smith on the Wakefield Corporation Water-Works. In the course of these, he stated that in 1880 the Corporation, on the advice of Mr. Edward Filliter, M.Inst.C.E., promoted a Bill to obtain water from the Rishworth Moors, about 25 miles to the west of Wakefield. These moors lie on the upper slopes of the Pennine Chain; heavy peat deposits in most parts covering the grits and shales of the millstone grits. The new scheme contemplated the construction of two reservoirs at Rishworth—namely, the Green Withens reservoir and the Ringstone reservoir—with catchwaters, a pipe-line 17 miles in length to the Ardsley reservoir, which was to be constructed some 5 miles north-west of Wakefield, filter-beds at Kirkhamgate, and a service reservoir at Lindale Hill. In 1889, powers were obtained to construct three smaller reservoirs at Rishworth—namely, the Booth Dean, the Oxygrains, and the Linsgreave reservoirs. All works authorized under the 1880 Act have been constructed; but the three reservoirs authorized under the 1889 Act have not been taken in hand.

The following are the capacities of the reservoirs in millions of gallons: Ringstone, 244; Green Withens, 240; Ardsley, 334. They are formed by earthen embankments, with the usual puddle core; the trenches being filled with puddle.

The Green Withens reservoir has a double embankment. The valley in which it is constructed branches downstream instead of upstream; the stream evidently having at some time changed its course. The two embankments meet at right angles on the shoulder of the hill between the old and the new stream-courses. The trench is 2055 feet in length; its maximum depth is 75 feet. It was excavated in grits and shales; and at the south end of the main embankment faulted and disturbed rock was met with over a length of some 150 feet. The rock and shale, though broken and ground-up, were quite water-tight throughout this disturbed area. For the greater part of the length of the trench the bottom is protected by a brick shoe; and, in addition, concrete walls 18 inches thick were carried some distance up, so as to cover the face of a band of rock and protect the puddle against possible damage by water passing along the fissures in the rock. The main tunnel is 6 feet diameter, and some 500 yards in length, passing round the north-east end of the puddle trench and main embankment. This tunnel is used for the purpose of delivering compensation water into the gauge-basin at the foot of the main embankment. A tunnel 3 ft. 6 in. in diameter, at the south end of the small embankment, enables the top 15 feet of water to be drawn off for the supply to the town. Two separate catchwaters convey water to this reservoir.

The Ringstone reservoir has one feature which distinguishes it from most reservoirs—namely, that it is constructed in a recess or saddle between two hills, and lies at the upper end of two valleys across which embankments have been constructed. Each embankment is pierced by a culvert—the one on the south-west side for the supply of compensation water, and the one on the north-east side for the supply to the city. The reservoir has only about 60 acres of natural gathering-ground; water being conveyed to it by means of a catchwater some 4½ miles long.

When the scheme is complete, the total gathering-ground will be 3337 acres. Six rain-gauges have been fixed at various points on the catchment area; and the average rainfall varies, according to the elevation and other circumstances, from 43 to 51 inches per annum.

The Ardsley reservoir is on the coal measures; and both worked and unworked mines have been the cause of considerable expenditure. In order to prevent leakage, a ring-trench was excavated to protect the weakest portion of the bottom of the reservoir. Outside the ring-trench, the bottom is good. The water delivered from the Ardsley reservoir to the filtration works is measured by a Venturi meter at the outlet of the reservoir.

The filtration works are situated at Kirkhamgate, about a mile below the Ardsley reservoir. Three seams of coal having been worked under the site, the uppermost being some 20 yards below the surface, it was considered advisable to carry clay-puddle sheeting under the whole area covered by the filter-beds. Under the cross-walls and outer walls of the beds gravel-puddle was used, and ordinary clay-puddle was continued at the back of the outer wall. The beds are five in number, having a total sand area of 10,000 square yards, capable of dealing with 3½ million gallons per diem. The whole of the inlet and outlet wells are grouped in one building; each filter bed having a separate outlet well, in which is fixed an automatic apparatus controlling the rate of filtration. Owing to the presence of peat on the gathering ground, the water in its raw state is acid, and has a strong action upon lead; at times being capable of taking up 2½ grains of lead per gallon, if left standing in a lead pipe for twelve hours. In order to counteract the acidity, the water is treated with approximately 1½ grains of ground chalk or carbonate of lime per gallon before filtration, and 1½ grains of quicklime per gallon, in the form of clear limewater, after filtration. From the clear-water well, the water passes to a service reservoir at Lindale Hill, a mile nearer Wakefield. This is a covered reservoir or balancing tank; the walls, piers, and covering arches being of brickwork in cement. The capacity of the reservoir is 1¼ million gallons.

The area supplied by the Corporation's works covers approximately 60 square miles. In addition to the city of Wakefield, it includes the urban districts of Castleford, Altofts, Featherstone, Methley, Normanton, and Whitwood, and part of the rural districts of Pontefract, Tadcaster, and Wakefield. The population supplied is 160,000, of which 53,000 within the city are supplied directly, and the rest are for the most part supplied in bulk. The Corporation's trunk mains extend to the boundaries of Featherstone, Whitwood, and Normanton. The length of the trunk and distributing mains under direct control is about 100 miles.

The quality of the water delivered to the town and out-districts is excellent. Bacteriological examinations show that, while the number of bacteria per c.c. in the raw water is small (usually about 30), the water after filtration is practically sterile.

The Ardsley and Ringstone reservoirs, with the catch-water feeding the latter, were designed by the late Mr. Edward Filliter, M.Inst.C.E., and were carried out under the supervision of Messrs. Filliter and Rofe. The Green Withens reservoir and catchwaters were designed and carried out by Mr. Henry Rofe, M.Inst.C.E. The filtration works at Kirkhamgate and the reservoir at Lindale Hill were designed and carried out by Mr. Clemesha Smith.

The Imperial Air-Fleet Committee.

The name of Mr. William Coward is known to many readers of the "Journal" as the Agent in England for a large number of Australian and New Zealand gas undertakings. Last Thursday, however, he appeared in another capacity—as Chairman of the Imperial Air-Fleet Committee, whose object is (1) to draw the attention of the Empire to the imperative need of aërial defence and (2) to provide complementary first units of an Imperial Air-Fleet for the aërial defence of the Overseas Dominions. Mr. Coward was very enthusiastically received at a dinner given by the Committee at the Connaught Rooms, when a presentation was made to Mr. Gustav Hamel, to commemorate his successful flight, with a passenger, from Dover to Cologne last April. Mr. Coward's well-known business capacity will, it is sincerely to be hoped, result in rousing the nation to a realization of the threatening peril from aeroplanes and airships, and the pressing need of the organization of adequate means of aërial defence, by giving a striking practical object-lesson of the powers of the modern aeroplane, and of what other nations are already equipped to do—not only with one machine but many hundreds.

Determination of Water in Coal.—This was the subject of a paper recently read before the Institution of Mining and Metallurgy by Mr. P. Litherland Teed. The author's object was to show that, in the simple drying method generally used for determining the percentage of moisture in a fuel, the accuracy is materially affected by the oxidation of pyrites making the result too low, and the volatilization of matter contained in the coal and oxidation of the coal itself making the result too high. He described a method which was devoid of these errors, and was somewhat more rapid in operation. The apparatus consists of a 100 c.c. pressure flask in which the coal is placed; a U-tube of about ½-inch bore, containing quicklime, a sulphuric acid drying-tube, and a vacuum pump. When by means of the pump a vacuum of about 700 m.m. has been created in the apparatus, boiling water is poured into a beaker containing the flask, and a boiling aqueous solution of sodium or calcium chloride into the beaker containing the U-tube. Under these conditions, the water originally contained in the coal is retained by the quicklime, while other volatile matter, owing to the absence of any chemical affinity for the lime and to the higher temperature of the U-tube, passes through to the sulphuric acid tube or the pump. From the increase in the weight of the lime tube the percentage of water in the coal is calculated.

REGISTER OF PATENTS.

Automatic and Continuous Analysis of Gases.

BOULTON, P. R., of Birmingham.

No. 5601; March 6, 1912.

This invention has particular application to apparatus for indicating and recording the percentage of carbon dioxide in furnace gases, so as to afford "a simple and reliable indication of the efficiency of the firing, and consequently of the effective working of the boiler." The patentee, however, does not limit the scope of its application, as, with equal advantage, it could be applied for indicating the percentage of other gases.

The essential feature of the invention is the means for recording the amount by which the pressure of gases in the absorbent tank differs from the mean of the pressures at the inlet and the outlet points. A novel feature of the apparatus also, and one essential to accurate recording, is the gauge or indicator employed. The object of this gauge is to measure the amount by which the pressure at the absorbent tank differs from the mean of the two extreme pressures, expressed as a percentage of the difference between the two extreme pressures. If, however, the absolute pressure of the gases at the inlet and outlet points is maintained at a constant value by any suitable means, it is possible to dispense with the compensating pressure gauge and to employ an ordinary liquid float gauge.

Liquid Meters.

KENT, W. G., of High Holborn, W.C.

No. 9197; April 18, 1912.

This liquid meter is of the type in which a series of pistons, working in a series of equidistant single-acting cylinders, are connected to a "wobbler" which controls the passage of the liquid to and from the cylinders, and also actuates a counter.

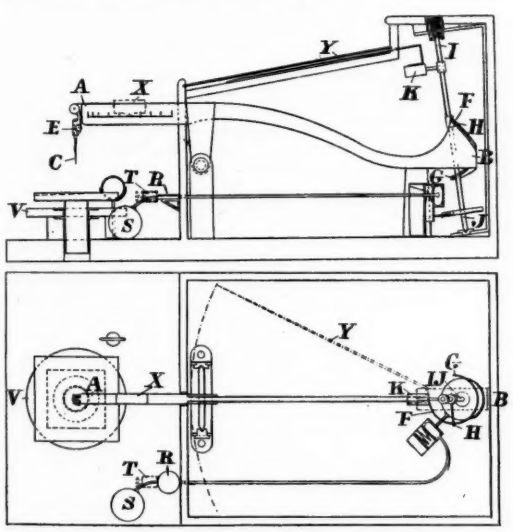
There is employed to control the passage of liquid to and from the cylinders a rotating flat valve moving over a flat valve-face, and acting in a similar manner to that described in patent No. 5994 of 1901.

Testing the Consistency of Tar.

WOOD, F., of Purley, Surrey.

No. 9603; April 23, 1912.

This apparatus for testing the consistency of tar and the like is of the kind in which the depth to which a weighted body penetrates in a given time is determined and indicated on a scale.



Wood's Tar-Consistency Testing Apparatus.

The apparatus consists of a balanced rod A B (one arm being shorter than the other) supported by plates attached to an axle, which has knife-edge or pin-point bearings fixed in sockets of a standard which is fixed to the framework. At the shorter end of the balanced rod is hung a needle C—the arm E to hold the needle being split so that a screw clamps it firmly. The holder is hung on an axle so as to be turned round to be examined and cleaned. At the other end of the rod is a helical path F G, the inclination of which is a calculated grade. On the path rests an arm H which is attached firmly to an axle (placed a little out of the vertical in the centre of the circular path) fixed in pin-point bearings at I and J respectively—the one at I being adjustable by means of a screw. On the axle is fixed a balance weight K to which is attached a pointer, which (passing through an opening in the framework) points to a radial scale divided to indicate the measure to a magnified scale of the depth of depression of the needle from its balanced condition.

To make a test, the tar is placed in a vessel on the table under the needle C, and the hand-screw V is turned until the surface of the liquid is just in contact with the needle—the pointer pointing to zero on the scale. The position of the weight X having been fixed, the time of the test being adjusted at R, the bulb S is pressed continuously (or the piston T is pushed forward), the brake moves from the drum, and the needle sinks into the liquid. The circular path F G rises and moves the arm H radially round the axle I J, and the pointer Y similarly moves radially. As soon as the air is exhausted, the brake acts on the drum, and the reading on the scale indicates a magnified measurement of the depth of the penetration of the needle into the liquid during the agreed time. To bring the arm back to the normal, the brake is released by pressing the bulb and the shorter end of the arm is raised by the finger until the motion is stopped by a stop-block, the pointer indicating zero again.

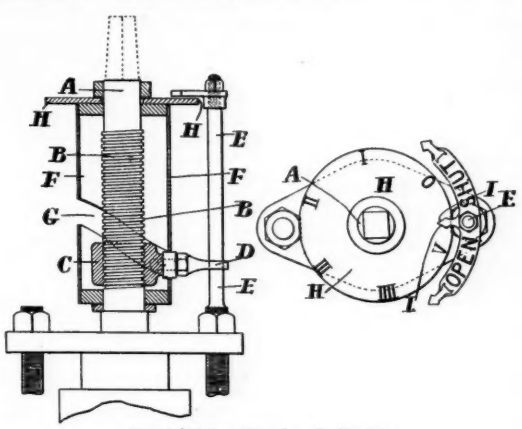
For thin liquids a blunt-pointed rod would be used instead of a needle.

Indicating the Opening of Valves, &c.

HAM, F. G. S., of Grosvenor Road, Westminster, S.W

No. 12,065; May 21, 1912.

This apparatus is for the purpose of indicating the position of a valve, cock, or other opening and closing device with regard to its seating—viz., whether open, closed, or at any intermediate position. It consists essentially of a revolving cylinder surrounding a screwed portion of the valve spindle and formed with a spiral slot through which passes the arm of a travelling nut, as shown in elevation (partly in section) of a valve cock, and plan of same.



Ham's Valve-Opening Indicator.

The upper end of the valve spindle A is screw-threaded at B; and on it works a nut C, provided with a lateral extension or arm terminating in a fork D. Mounted on the flange of the valve is a vertical guide pin E, which is embraced by the fork in such manner that the nut C is prevented from revolving about the spindle, but is free to rise up the spindle when the latter is turned by the usual key.

The guide may be marked in inches (and fractions), so that the pointer, as it travels up or down with the nut, indicates the height or position of the valve for taking a reading vertically where the conditions permit. But in order to provide also for a reading horizontally or in plan (which constitutes the main feature of the invention), a revolving cylinder F is employed surrounding the screwed portion of the valve spindle. This cylinder is formed with a spiral slot G or groove, through which passes the extension of the travelling nut in such manner that the nut, as it travels in a vertical line upwards or downwards, causes the cylinder to rotate around the spindle—the amount of rotary movement at each turn of the spindle being determined by the pitch of the spiral slot in the cylinder.

The top face of the cylinder carries a disc or dial H marked with numbers and divisions, indicating inches and fractions, and which markings come opposite a pointer or indicating finger I mounted at the top of the guide pin E, as the cylinder F is rotated by the action of the travelling nut.

Purifying Illuminating, Coke-Oven, and Other Gases.

DAVIDSON, W. B., of Gravelly Hill, Birmingham.

No. 12,720; May 30, 1912.

The patentee claims "a process for the purification of illuminating, coke-oven, or other gas consisting in first removing a large proportion of the carbon dioxide contained in such gas by bringing the gas into contact with ammonia, either in a gaseous form or in an aqueous solution, then removing the ammoniacal liquor at this stage from the primary washer or scrubber and distilling it, and subsequently subjecting the illuminating or other gas to a further treatment, using an ammonia solution or gas to absorb the sulphuretted hydrogen and any carbon dioxide remaining in the illuminating or other gas."

In carrying out the invention, ammonia (either in gaseous form or in aqueous solution) is brought into contact with the crude gas—for example, coal gas—in a primary washer or scrubber or in the first section or sections of a washer or scrubber. The first action of the ammonia coming into contact with the crude gas in the presence of water is to absorb a large proportion of the carbon dioxide. In the example mentioned (coal gas), the amounts of carbon dioxide and sulphuretted hydrogen present in the crude gas may be taken to be in the relative volumes 2 and 1 respectively; but in some cases they may be 3 and 1. By the primary washing the carbon dioxide and sulphuretted hydrogen can be removed roughly in the proportion of 9 to 1; so that after the primary washing or scrubbing there will be a large proportion of sulphuretted hydrogen relatively to carbon dioxide remaining in the gas.

It is, therefore, important, the patentee points out, to remove the ammoniacal liquor resulting from this primary washing from the

washer or scrubber at this point and distil it separately, preferably by the process described in patent No. 23,696 of 1911; and then the sulphuretted hydrogen may be removed from the gases issuing from the still on the distillation of this liquor by passing the impure gases through oxide of iron contained in an open or closed purifier in known manner. The carbon dioxide, after the sulphuretted hydrogen has been removed from it in this manner, may pass into the atmosphere; but it is preferably collected, as it is then in a very high state of purity. The small proportion of the sulphuretted hydrogen originally mixed with the carbon dioxide renders this gas easily removable from the carbon dioxide. The carbon dioxide so obtained may, owing to its high degree of purity, be employed for the manufacture of ammonium carbonate.

After the bulk of the carbon dioxide has been removed by this primary or preliminary washing, the gas is subjected to further washing or scrubbing operations, or other treatment, for the removal of the rest of the sulphuretted hydrogen. This treatment consists in passing the gas through a second washer or scrubber, using an ammonia solution or gas to absorb the sulphuretted hydrogen, and also any carbon dioxide remaining in the gas after the primary washing.

The liquor from this operation is distilled, and the sulphur recovered from the gaseous sulphuretted hydrogen in a sulphur kiln or as sulphuric acid.

By the process set forth it is claimed that the quantity of sulphuretted hydrogen obtained relative to the amount of carbon dioxide is very largely increased. It is usually considered that 25 per cent. is the lowest percentage content of sulphuretted hydrogen required for the satisfactory working of a Claus sulphur kiln; but the present invention is said to provide a gas in which the percentage is very much higher, and this "renders the working of the sulphur kiln or acid plant very much more efficient."

Photometers.

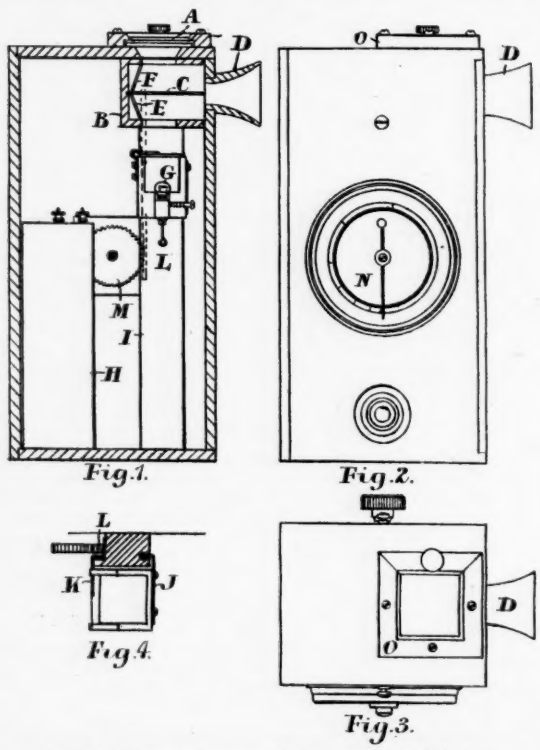
SIEMENS BROTHERS DYNAMO WORKS, LIMITED, of Westminster, and CALLOW, S. H., of Harringay.

No. 15,660; July 4, 1912.

This invention relates to a photometer of the type in which the intensity of illumination of a given plane surface by a source of illumination already in position—for example a street light—is measured; a standard electric lamp being used for comparison. The main feature of the invention consists in feeding the standard lamp used in the photometer at a voltage which is considerably less than its normal voltage, so that the rate of blackening of its bulb is reduced and the candle power of the lamp at constant supply voltage remains practically constant for a considerable period.

As an example, the patentees say they may use a 2·5 volt metallic filament with a 1·4 volt battery. In general, they arrange that the watt consumption per candle power is increased about 100 per cent. above its usual value.

A further feature of the invention consists in using, in combination with the photometer, tinted glasses to modify the colour of the light, the intensity of which is to be measured, so that it approximates to the colour of the light of the standard lamp.



Callow's (Siemens Dynamo Works Company) Photometer.

Fig. 1 is a vertical section through the photometer; fig. 2, an elevation of the photometer; fig. 3, a plan; fig. 4, a plan of the standard lamp-holder on its guide.

The photometer comprises a box at one end of which is an aperture A through which enters the light to be measured. The photometer-head B is immediately under the aperture and comprises a box-like chamber, painted dead-black, with apertures in two opposite sides, one to admit the light from outside, the other to admit the light from the standard lamp. In the middle of the photometer-head is placed, parallel to the two apertures, the photometer screen C; and opposite one end of the screen is arranged an eye-piece D let into a hinged side of the photometer.

The photometer screen consists of two pieces of celluloid, one surface of each of which is rendered white by being rubbed down with pumice powder and water—the two pieces being cemented one on each side of a thin sheet of lead.

Reflecting mirrors E F are arranged at an angle to the screen so that the two surfaces of the screen are seen side by side when looking into the eye-piece.

The standard lamp G, fed from the battery H, ismounted in a plug pushed into the casing of a box painted white inside and dead-black outside. In order to balance the illumination of the two sides of the photometer screen, the box is aranged so that it can be moved by rack-work along the vertical rail I, as it is attached by screws to carrier plates J K which run in channels in the vertical rail. In the channel on the left-hand side of fig. 4 a rack L is fixed; and with the rack a pinion M engages—mounted on a spindle passing through the photometer—to a knob outside for rotating it. At the opposite end is a pointer which indicates on a dial N the position of the box and the intensity of illumination of the screen face in candle feet.

For modifying the colour of the illumination the intensity of which is to be measured, and also reducing the intensity of the illumination of the screen face, tinted or smoked glasses can be inserted through a slit in the frame O. The reduction of the intensity by these glasses may be allowed for and extra scales be provided on the dial N, so that the intensity of illumination of the screen surface when the smoked or tinted glass is absent may be indicated directly by the pointer.

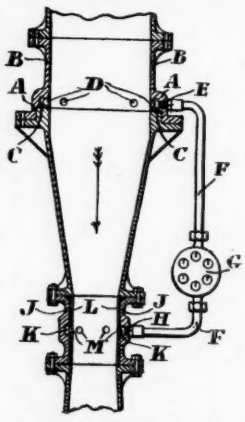
Meters of the Venturi Type.

KENNEDY, R.; a communication from STRUBEN, A. M. A., of Pretoria, South Africa.

No. 21,498; Sept. 21, 1912.

The invention has for its object to provide simple and effective means for measuring inferentially the quantity of liquid passing through meters of the Venturi type.

There is provided, between the part of the Venturi tube which is of large area and its constricted throat, a bye-pass pipe or passage, in which is interposed a comparatively small meter of any convenient form—preferably inferential. The drop in pressure between the parts of the Venturi tube of greater and lesser area causes a proportion of the liquid flowing towards the Venturi tube to flow through the bye-pass passage, and in passing through it, it operates the meter there. And since the amount of liquid flowing through the bye-pass tube is directly in proportion to the quantity passing through the Venturi tube, the small bye-pass meter may readily be calibrated to indicate with sufficient correctness the amount of liquid passed by the Venturi tube.



Struben's Meters of the Venturi Type.

In the example shown, the Venturi tube is built up (as is common practice) in a series of sections. In the jointing flange A of a section B, of full diameter at the entrance end of the tube is cut a groove C, closed by the flange of the next adjacent section. This groove communicates, by a series of apertures D, with the interior of the tube, and by an aperture E with a bye-pass pipe F, connected to the inlet side of a meter G (diagrammatically illustrated and of any desired form—preferably inferential). The outlet from the meter communicates with a continuation of the bye-pass pipe F, which, in turn, communicates with an aperture H in the throat section J of the Venturi tube, and which aperture, in its turn, communicates with an internal peripheral groove K in the section. The groove is internally closed by a liner L, held between the flanges of the adjacent tube sections, and pierced opposite the groove by a series of apertures M communicating with the interior of the tube.

The patentee states that the use of "complex integrating devices," hitherto considered necessary to obtain quantity readings from a Venturi tube, is obviated—a direct quantity reading being obtainable from the small bye-pass meter.

Braiding Fabrics for Incandescent Gas-Mantles.

MOFFAT, ROSS, AND CO., LIMITED, and NEUMEISTER, C. W., of Upper Thames Street, E.C.

No. 27,122; Nov. 25, 1912.

In braided incandescent gas-mantles it has hitherto been customary, the patentees point out, to cross the single longitudinal or diagonal threads of one set alternately with the single horizontal or diagonal threads of the other set—corresponding to the weft and warp of woven goods. An approximately uniform size of the meshes resulted; but, for the purpose of giving to the mantle the necessary strength after incineration, the threads had to be placed relatively close to one another. The meshes were small-sized—an observation also referring to knitted and woven mantles.

Practical experiments have, they say, demonstrated that "these small meshes do not permit the passage of the desirable maximum of

oxygen to the flame, and that blacking at low and breaking under high gas pressure arise frequently as a consequence of the small meshes."

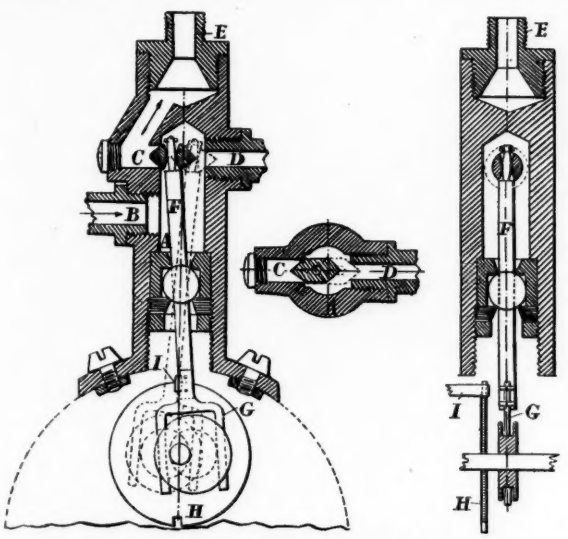
Consequently, they claim: 1. In braiding fabrics for incandescent gas-mantles, a method of spacing the threads in such manner that a double-width interval precedes or follows two or more threads which lie in close proximity—such set of distanced threads being crossed by another set of threads similarly or dissimilarly distanced and traversed by longitudinal threads. 2. The method of varying in one set of threads the number and spacing of the threads employed in such manner that wider spaces follow or precede two or more closely lying threads and narrower spaces precede or follow single threads, or *vice versâ*—thus forming with the similarly or dissimilarly spaced threads of the other set and with longitudinal binding threads two or three or more categories of larger and smaller meshes.

Automatically Lighting and Extinguishing Gas-Burners.

FARGE, F. C., of Nice.

No. 24,223; Oct. 23, 1912. Convention date, Oct. 27, 1911.

The apparatus covered by this patent comprises a rod operated by an eccentric outside the gas-chamber and actuated by clockwork. The rod oscillates in a metal joint which closes the gas-chamber so that only the upper part of the rod or lever is within the chamber; this upper part being provided with two metal plugs. which are caused, by the oscillation of the rod or lever, to obstruct or allow the passage of the gas according to requirement.



Farge's Automatic Gas-Burner Lighter and Extinguisher.

As shown, the gas enters the chamber A through the connection B, and leaves it through either the aperture C or D, according as the gas is to be supplied to the main burner or to a bye-pass burner E is a connection for fixing the main burner. A rod F, capable of oscillating round a metal spherical joint fixed near the middle of the rod, carries at one end two metal plugs, of which one is adapted to close the aperture C and the other the aperture D. At its opposite end the rod carries a fork G, which is embraced by the cheeks of an eccentric fixed on a shaft of the clockwork. On the shaft is mounted a disc H (with two notches) which serves, by means of a lever I, adapted to be engaged in one or the other of the notches, to fix the apparatus in position for lighting or for extinguishing as the case may be.

When the time arrives for lighting or extinguishing the main burner, the clockwork causes the eccentric to make exactly a half-revolution, and move with it the fork G. The rod F, by its oscillation, then moves the plugs on it, thereby effecting the lighting of the main burner jet and the extinction of the bye-pass burner, or *vice versâ*.

Treating Carbonaceous Material.

PARKER, O. J., of Bishopsgate, E.C.

No. 28,582; Dec. 11, 1912.

This invention relates to the treating of carbonaceous material "in vacuum between certain limits of temperature and degrees of vacuum," whereby more effective separation and collection of the tar substances, the ammonia liquor, and the light oils are secured; while at the same time there are ensured "the formation of a high proportion of such bye-products very rich in the valuable light oils and the production of a superior fuel from such carbonaceous substances as are capable of being converted into coke or charcoal by ordinary methods of destructive distillation."

In carrying out the invention the patentee says he does not work at combined temperatures and pressures other than those specified later on, "as it has been found that the gases and volatile matter are effectively and rapidly removed from the fuel and retort by means of the combined temperatures and pressure set forth, and the destructive distillation of the carbonaceous substance is rapidly and effectively carried out with the final production of a dense but porous fuel, retaining a sufficient percentage of volatile matter to render it easily ignitable and smokeless burning."

In treating the coal in accordance with the invention, it is placed in a retort having air-tight doors, and in which a temperature of from 460° to 700° C. is maintained, in combination with which a simultaneous pressure of from 20 inches of mercury below atmospheric pressure to a practically perfect vacuum is maintained within the retort. By a "practically perfect vacuum" the patentee says he means "as great a reduction of pressure below atmospheric pressure as can be continuously maintained by a well-designed apparatus—the limit of such vacuum being 29½ inches of mercury with the barometer standing at 30 inches."

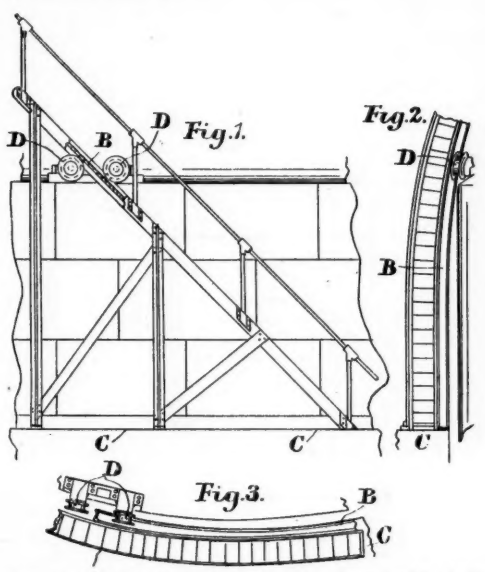
The vacuum is also maintained throughout a condensing apparatus during the whole of the time occupied in distillation, and such volatile matter as is capable of being condensed *in vacuo* is recovered. The gas is then passed through ordinary scrubbers (after passing through the vacuum pump) in order to recover the highly volatile oils which were not recovered in the condensing apparatus. The "required temperature" is "effected by any furnace which can be regulated to maintain the desired limits of temperature, while at the same time the pressure is obtained by any exhausting pump capable of maintaining the limits of such pressure in the retort and condensing apparatus."

Ladders for Spirally-Guided Gasholders.

R. & J. DEMPSTER, LTD., BEARD, G. F. H., and SCOTT, J. W., of Manchester.

No. 4338; Feb. 20, 1913.

The inventors provide the ladder (or sections of it) in more or less inclined form relatively to the ground line; and it is formed with means which are in spiral gear, so to speak, with the holder or the lifts. This may be accomplished by providing the side of the ladder nearest the holder with a spiral guide rail or rails, in gear or in contact with guide rollers (or maybe guide blocks) supported by a carriage attached to the next inner lift, or to the holder; the foot of the ladder being attached to the top of the dip of the adjacent outer lift, or to the top of the tank side, as the case may be. Alternatively, the guide rail for the ladder may be attached to the holder or lift side or sheeting, and a series of rollers or blocks be formed projecting from the adjacent side of the ladder. In all cases the angle of spiral of the guide rails referred to would be equal to that of the ordinary guide rails of the holder or lifts, for correct working.



Beard and Scott's (R. & J. Dempster) Ladders for Spiral Gasholders.

Fig. 1 is a side elevation (partly in section) of a ladder arranged according to one form of the invention, in connection with one of the lifts of a holder, assumed to be only partly raised. Fig. 2 is a side elevation of fig. 1. Fig. 3 is, in part, a plan view of fig. 1.

The ladder is formed with an attached spiral guide rail B—the ladder itself is, in the example given, also assumed to be of spiral form. The foot of the ladder is secured to the tank side C, or it may be to an outer lift, while the guide rail is engaged by rollers D mounted on the inner lift of the holder. Although the holder has spiral motion in rising, its ladder foot is always in or about the same plane as the opposite portion of the adjacent spiral ladder on the tank side, so that, whether the ladders be at their lowest position, or at any intermediate position, it is always possible for the workman to pass up the outermost ladder until he reaches the ladder on the next inner lift, when he may pass across to it, and so on, and also that, at all heights of the holder or lifts, he need not tread on any length of ladder which is not supported by rollers either at or above his highest position, necessary for inspection or otherwise. For convenience of changing from one ladder to another, a platform may be arranged projecting from an outer ladder—say, to the next inner one, or nearly so.

Gas Coal Contracts with North Wales Collieries.—A large number of the contracts for the supply of gas coal during the ensuing year have been settled with the North Wales collieries, and the average advance which has had to be agreed to has been from 1s. to 1s. 6d. per ton on last year's figures. For large coal the average price is from 13s. to 14s. per ton; and nuts (which are in great demand, but of which the supply is very limited) are being bought at 11s. 6d. to 12s. against contract.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Institution of Gas Engineers, and "Point-Fives."

SIR,—Among the several interesting papers proposed to be read at the forthcoming meeting of the Institution there is an absence of any particular reference to our electrical competitor; and I mention this point with diffidence, for there are undoubtedly others who feel the fierce conflict much more than I do. Nevertheless I am afraid that in the gas boom of recent years it has been overlooked that our competitor has by now surmounted the temporary set-back caused by the *entrée* of the metal lamp, and, having done so, is looking about for business in channels other than lighting. To obtain this necessitates a low rate; and whereas in the days of the carbon filament lamp the consumption per lamp or consumer was much greater (at least double), with the services then laid there is a margin of capacity for additional consumption, which can now be supplied at a low rate, because it will not necessitate for old consumers a larger supply service, or to new consumers a greater area or cross section than that laid prior to the period I refer to.

What then do we find our competitor doing? Initiating a principle which the gas industry generally has so far fought-shy of—that of preferential and differential rates for heating and cooking. In the following towns, the electrical rate for cooking and heating is ½d. ("point-five" of a penny) per unit, where the current is used for lighting:

Bradford,
Carlisle,
Luton,
Marylebone,
Reading,
Southampton,
Sunderland.

And there are, undoubtedly, others of equal or lesser importance.

This principle is doubtless the object of "Point-Fives"—the significant title adopted by the band of electrical engineers who advocate or promote the principle I have mentioned. It is a matter which the gas industry will do well to tackle and consider. Years ago I saw much evidence of its approach, and have since observed its continual growth. The competition of electricity for heating and cooking is but in its early stages; and although there are undoubtedly handicaps in its relative efficiency compared with gas, this drawback will in time be overcome by the electrical industry.

I throw out the point at this opportune moment, in the hope that, even if it does not occupy any attention now, it will not be lost sight of, but tackled at an early date, by the organization to whom we look to give the lead for enterprise and progress in our industry.

R. W. E.

June 6, 1913.

Lady Demonstrators.

SIR,—As we are being frequently consulted regarding cookery and laundry lecturers and demonstrators, whose services are required in connection with gas exhibitions, &c., we shall be glad to have from any of your readers particulars of ladies who have assisted them in this direction, and are willing to place their services at the disposal of other gas authorities.

We have already several names on our reference list, which we wish to be as complete and serviceable as possible.

The following items of information should be given:

Full name and address.
Qualifications.
Experience.
References.
Terms.
Vacant dates.

WM. M. MASON, Secretary,
British Commercial Gas Association.

47, *Victoria Street, S.W., June* 6, 1913.

Gas-Fire Construction.

SIR,—Your correspondent, "Experimenter," has not quite understood the meaning of the question which I addressed to you last week. I presume that, when the sheet of nickel-plated copper is held over the canopy of a gas-fire, any escaping fumes blacken the nickel-plated copper. But is this the case? If not, will your correspondent, "Experimenter," kindly explain what does really happen?

ENQUIRER.

June 4, 1913.

The Prints of Papers for the Institution Meeting.

SIR,—Referring to your article in the current number of the "JOURNAL," with reference to the issue of advance copies of the papers to be read at the Institution's forthcoming meeting, the Emergency Committee, to whose attention the matter has been brought, desire me to say that the Council decided upon the course which is being carried out after having given the fullest consideration to the subject.

It was expected (and from the forms which have already been returned filled in there is evidence to show) that members would, from the title of the paper, be able to say whether they were likely to take part in the discussion; that they would apply for an advance copy of the paper and prepare their remarks; or, if they were interested in the subject but did not intend to speak, that they would apply for a copy of the paper and not indicate that they wished to join in the discussion. Those preferring to see the paper before deciding whether they will speak or not are making application for advance copies, and after reading the paper will then no doubt send in their names as soon as possible, should they desire to join in the discussion.

If in your next issue you will be so good as to call attention to this provision, the Committee will be obliged. They feel that it will be of assistance in avoiding the difficulties contemplated in your article, and that it will conduce to that success for the experiment which we all so much desire.

WALTER T. DUNN, Secretary.

39, *Victoria Street, Westminster, S.W., June* 5, 1913.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Derby Corporation Bill, Lymm Urban District Council Bill, Mid Kent and East Kent District Water Bill.

Bills read a second time and committed: Bishop's Waltham Water Bill, Mynyddislwyn Urban District Council Bill, Pontypridd and Rhondda Joint Water Board Bill, Westgate and Birchington Gas and Electricity Bill.

Bills reported: Ebbw Vale Water Bill, Herne Bay Gas and Electricity Bill, Leeds Corporation Bill, Rochford Rural District Council Bill, United District Gas Bill.

Bill read the third time and passed: Bradford Corporation Bill.

The Gas and Water Orders Confirmation Bill (No. 1) has been referred to a Select Committee, consisting of the Duke of Bedford (Chairman), the Earl of Eldon, Lord Harlech, Lord Gorell, and Lord Charnwood; to commence sitting to-day.

The Carlow Rural District Council and the Carlow Board of Guardians have petitioned against the Gas and Water Orders Confirmation Bill (No. 1), in respect of the Bagnalstown Gas Order; the Barry Urban District Council against the Pontypridd and Rhondda Joint Water Board Bill; and the Isle of Thanet Rural District Council against the Westgate and Birchington Gas and Electricity Bill.

The opposition to the Titchfield District Gas Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Gas and Water Provisional Orders Bill (No. 2), Grays and Tilbury Gas Bill [Lords], Llantrisant Gas Bill [Lords], Porthcawl and District Gas and Electricity Bill [Lords], West Hampshire Water Bill [Lords].

Bills reported: Liverpool Corporation Bill, Tottenham and Edmonton Gas Bill.

Bills read the third time and passed: Derby Corporation Bill, Local Government Provisional Order (Gas) Bill, Lymm Urban District Council Bill, Silloth Gas Bill, South Staffordshire Mond Gas Bill [Lords], South Staffordshire Water Bill [Lords].

The Hertfordshire County Council and the Watford Gas and Coke Company have petitioned against the Electric Lighting Provisional Orders Bill (No. 5), in respect of the Watford Electric Lighting (Extension) Order.

TOTTENHAM AND EDMONTON GAS BILL.

HOUSE OF COMMONS COMMITTEE.—Wednesday, June 4.

(*Before Mr.* HERBERT CRAIG, *Chairman, Mr.* HOGGE, *Mr.* GEORGE LLOYD, *and Mr.* POINTER.)

This Bill provides for the acquisition by the Tottenham and Edmonton Gas Company of the undertaking of the Enfield Gas Company, and also for the transfer to the Tottenham Company of the Wood Green Urban District Council's Electric Lighting Order. There was only one opponent; but reports were presented upon the Bill by the Local Government Board and the Board of Trade.

Counsel for the Bill were Mr. HONORATUS LLOYD, K.C., Mr. VESEY KNOX, K.C., and Mr. TYLDESLEY JONES; while the only opponent, the Printers' Almshouses Corporation, was represented by Mr. LEWIS COWARD, K.C.

The CHAIRMAN, at the outset, mentioned that he was one of three Trustees and had a small holding in the Tottenham and Edmonton Gas Company; and if the parties wished it, he would retire.

No objection, however, was taken.

Mr. HONORATUS LLOYD, in opening the Bill, said he need not trouble the Committee at any great length with regard to the acquisition of the Enfield Gas Company's undertaking, because there was no opposition to it; the matter having been amicably arranged with the consent of the local authorities, who recognized that the amalgamation of the Enfield Company would be for the benefit of the consumers, as well as of the two Companies concerned. Therefore, subject to any information which the Committee might desire, he need not dilate upon that part of the Bill. The other main object of the Bill was to provide for the transfer to the Gas Company of the Electric Lighting Order of 1902 which was granted to the Wood Green Urban District Council. Here, again, the transfer was by agreement with the Wood Green Council—indeed, it was at the suggestion of the Council that the negotiations for the transfer were undertaken. In connection with the proposal, however, clause 39 provided for the use of certain land for the purpose of a generating station. This land was the Gas Company's property; but against the proposal to use the land in this way there was a petition to which he would refer later. He would first explain the various circumstances. The Tottenham and Edmonton Gas

Company were incorporated in 1859, and had been before Parliament subsequently and obtained many Acts and Provisional Orders. The issued capital was £120,000 of "A" stock and £543,940 of "B" stock. The "A" stock had a standard dividend of 5 per cent., and the "B" stock one of 3½ per cent. There was also issued £149,470 of debenture stock; making a total issued capital of £813,410. There was unissued "B" stock to the value of £437,787, and £200,000 of debentures; making a total of £637,787 unissued. This was one of those companies who were able to supply gas at a low price. The price charged by them to-day—viz., 2s. 1d. per 1000 cubic feet—was only beaten by one company in the southern districts—Wandsworth—who charged 1s. 9d. only. The Company's limits for the supply of gas included Tottenham, Edmonton, Wood Green, and Southgate. Dealing with the position as regards electric lighting, Counsel said that, in the early days of electric lighting, the Company contemplated seeking powers to supply electrical energy, and in 1897 communicated with the various local authorities in their area to this effect. In 1898, the Company obtained an Act, by section 28 of which they were authorized to apply for licences or Provisional Orders to supply electricity and to employ the capital which was to be raised under the Act for the purpose of electricity supply. Notice was given to the local authorities that the Company proposed to apply for Electric Lighting Orders; but as the local authorities intimated that they themselves intended to do the same thing, the Company abandoned their proposal. In 1902, the Wood Green Council obtained an Electric Lighting Order; and from that date until 1911 various schemes had been considered. Nothing, however, had been actually done, and no supply of electricity was being given in Wood Green. In 1911, the Council approached the Gas Company, and asked whether they were still in the mind to undertake the supply of electricity, with the result that negotiations ensued and the present Bill was the outcome. This was necessary, because under the Act of 1898 the Company could only apply for new Provisional Orders, and could not take transfers of existing Orders. The main provisions of the transfer were that the Gas Company should pay the Council £500 towards the costs of obtaining the Order of 1902, with certain powers of purchase on the part of the Council. In the first place, in addition to purchase under the terms of the Electric Lighting Act, at the expiration of twenty-one years, the Council could purchase the electricity undertaking of the Company in 1928 by giving twelve months' notice, on payment of the capital expenditure, *plus* 20 per cent.; in 1929, by payment of the capital expenditure, *plus* 19 per cent.; and so on for each succeeding year until 1948, when the purchase price would be the capital expenditure only. In the Wood Green Order, the maximum price was 7d. per unit; but as a result of the transfer the maximum price of lighting would be 5d. per unit; for power purposes, 2d. per unit; and for public lighting, 2½d. per unit. The Company were already supplying in Wood Green a certain amount of gas for the purpose of generating electricity. What had been done was that in certain cases private individuals had installed gas-engines to drive dynamos; one consumer of this character taking a large supply of gas for this purpose. In addition, the Alexandra Palace for a portion of the establishment used electricity which also was generated by dynamos driven by gas-engines, for which the Company supplied the gas. It was desirable, therefore, that the demand which undoubtedly existed in Wood Green for a supply of electricity should be met. It was not a fresh idea at all to entrust electric lighting powers to a gas company. It had been done in the case of the Ascot and Brixham Acts of 1906, the Aldershot and Yorktown and Blackwater Acts of 1909, the Farnham and Bishop's Stortford Acts of 1910, and the Bognor Act in 1912. It was also very common on the Continent. In Brussels, both electricity and gas were supplied by the Imperial Continental Gas Association; in Germany, there were 23 towns so supplied, including Potsdam; in Austria-Hungary and Switzerland the same thing applied; and in the United States also it was quite common. The Tottenham Company in this instance proposed to supply direct current on the three-wire system at 240 and 480 volts. It was intended to use gas-engines for driving the dynamos. Thus it would be possible to produce electricity under the most economical terms. It was proposed to put the powers of the Provisional Order into operation forthwith. It was with regard to a site for the generating station that the Company were met with opposition; this being at the instance of the Printers' Almshouses Corporation. In this connection, it was pointed out to the Committee that although, according to the Standing Orders, over 1000 notices had been sent out to property owners within 300 yards of the site, there was only this one opponent. The ground of the objection was the likelihood of nuisance from the working of the generating plant. As, however, gas-engines would be used, it was the contention of the Company that there would be neither noise nor nuisance. Although the petitioners stated that the site of the almshouses had been selected because of the extreme quietude of the neighbourhood, the district could hardly be called a quiet one to-day, whatever it might have been in 1872 when the almshouses were first built—indeed, there was a small engineering works adjoining the almshouses, whereas the electricity generating station would be 100 feet away. There was also within a few yards a large tramway depôt, with cars running in and out all day on very sharp curves. Tramcars ran past the almshouses all day long, and so did motor buses. For noisy traffic this particular district was about as well off as could be conceived. With regard to the reports of the Local Government Board and the Board of Trade, most of the points had been met; but there were just one or two which he must describe to the Committee, because the suggested alterations had not been made. Clauses 52, 53, and 54 enabled the Company to disconnect supplies at the meter instead of taking up the road to do so, and also to make the consumer pay for the reconnecting when this had to be done. This only applied to the case of default on the part of the consumer. The Local Government Board pointed out that this was an unusual clause (although a similar one was in the Bristol Act of 1910), and suggested that the special circumstances in the present case should be explained to the Committee. Counsel pointed out that the point had been discussed in connection with the Westgate and Birchington Bill this year and allowed. As a matter of fact, the Home Office were satisfied with the clause. The Board of Trade reported with regard to clauses 42 and 43. In the case of the former, the expediency of which was doubted, it followed the clause inserted in all electric power Acts of recent years, and permitted the Company to take transfers of Electric Lighting Orders from any local authority or company. An addition had been made, at the request of the Tottenham Council, that the Board of Trade should hear representations from any local authority in the Company's area of supply before granting any transfer. Clause 43, "Power to Contract for the Execution of Electrical Works," had been struck out; the Board of Trade objecting to it. With regard to clause 46, "Sliding Scale as to Dividend on Capital to be Dependent on Price in any Half Year," instead of "in any year," under section 26 of the Company's Act of 1898, the Board of Trade made the suggestion that this should be worded so that the selling price of gas should vary according to the divisible profits of the gas undertaking only, and not according to the dividends paid on the whole capital, including the plant for the electricity works. Apparently the idea was to protect the gas consumers from a possible loss on the electricity undertaking. The Company, however, regarded this as most important, inasmuch as they fully anticipated making a profit on the electricity undertaking, and any restriction of the kind suggested would militate against raising capital by auction on the most favourable terms. Therefore the Company objected as strongly as they could to the suggestion of the Board of Trade. The point had also been very carefully considered by the Unopposed Bills Committee of the House of Commons in connection with the Herne Bay Gas Bill this session, and the proposal was not adopted.

Sir *Corbet Woodall*, the Chairman of the Tottenham and Edmonton Gas Company, confirmed the statements made in the opening speech, and incidentally expressed the view that it was unfortunate that there are not more cases of the combination of electricity and gas works, especially in small areas, as the supply of electricity could then be given much more cheaply than by a separate company. Such combinations also added to the stability of the companies as a whole, and enabled capital to be raised much more easily. Competition led to the undue spending of capital, which could not in the long run tend to the benefit of the consumer.

In answer to Mr. VESEY KNOX, he assented to the proposition that the Tottenham Company were able to sell gas more cheaply than the Gaslight and Coke Company by reason of the absence of competition. Dealing with the petition of the Printers' Almshouses, he said the Company would be very unwilling to injure the institution in any way. Personally, he did not believe there would be any sound outside the walls of the generating stations, as the gas-engines driving the dynamos would run most silently.

Mr. LEWIS COWARD, in his cross-examination, pointed out that under the Bill the Gas Company were actually taking away the common law rights he now had of proceeding against anyone for committing a nuisance, inasmuch as section 81 of the Electric Lighting Clauses Act of 1899 was expressly excluded from applying to the Company, although it did apply to the Wood Green Council under the Order of 1902.

Witness said he did not wish to take away any rights which might exist and which applied to electricity works.

Mr. TYLDESLEY JONES said that all the London electricity works are expressly excluded from section 81 of the Act of 1899.

Mr. LEWIS COWARD said he had a list of fifteen precedents for its insertion.

After further discussion,

Mr. VESEY KNOX, for the promoters, said that if it would satisfy Mr. Coward he would offer to insert section 81.

Mr. LEWIS COWARD said his clients felt very strongly that there were a number of other sites in the Company's area where a generating station could be erected without being a nuisance to anybody.

The CHAIRMAN said the Committee were not much impressed with that as an argument. He understood Mr. Coward would be satisfied with section 81.

Mr. LEWIS COWARD said he was not at the moment prepared to advise his clients to accept this offer absolutely, but would take the opportunity of discussing the matter during the luncheon interval.

Witness, dealing with the Board of Trade suggestion with regard to clause 46, said it would be impossible to accept this, for the reason stated by Mr. Honoratus Lloyd. The capital of the Company had been subscribed on the strength of their powers, which, since 1897, had included electric lighting; and, consequently, if the profits from electric lighting were not to be taken into account in arranging the selling price of gas, a less price would be bid for the stock when it was offered by auction.

The CHAIRMAN thought it would be very difficult to divide the two things.

When the Committee reassembled after lunch,

Mr. LEWIS COWARD said he had advised his clients to accept the insertion in the Bill of section 81 of the Electric Lighting Clauses Act of 1899.

The Committee then declared the preamble of the Bill proved.

Mr. VESEY KNOX, dealing with the Board of Trade suggestion regarding clause 46, said that if the Board had attempted to draft a clause to give effect to its own suggestion, it would have at once realized how impossible it was. He personally had tried to do so, but had failed. Any such clause could be "dodged" by making the price of gas, for instance, supplied for driving the dynamos excessively low.

The Committee expressed their satisfaction with the Company's explanation, and refused to adopt the Board of Trade suggestion.

The clauses were then gone through, and the Bill was ordered to be reported for third reading. The clause with regard to disconnecting at the meter was allowed, as well as the others to which the attention of the Committee had been drawn by the Government department.

The Mexborough Water Company are seeking power to raise an additional £10,000 of capital in order that they may make further extensions at their works. Since the Company was formed in 1879, great improvements have been made, and the capital of the concern has been exhausted.

GAS-MAINS OVER THAMES BRIDGES.

LONDON COUNTY COUNCIL (LAMBETH BRIDGE) BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, June 3.

(*Before Mr.* HERBERT CRAIG, *Chairman, Mr.* HOGGE, *Mr.* GEORGE LLOYD, *and Mr.* POINTER.)

This Bill seeks powers to construct a new bridge over the Thames in place of the existing Lambeth Bridge. The only opposition was by the Gaslight and Coke Company; a petition by the Metropolitan Water Board being settled in the course of the morning.

Mr. VESEY KNOX, K.C., and Mr. SNAGGE appeared for the promoters; Mr. BALFOUR BROWNE, K.C., and Mr. PITMAN represented the Gaslight and Coke Company.

Mr. VESEY KNOX, having explained the objects of the Bill, said that there was only one effective opposition—that of the Gaslight and Coke Company—although this could hardly be said to be an opposition to the Bill as a whole. Nevertheless, technically the Gas Company were entitled to raise their point on preamble if they thought fit. Their objection was really a subsidiary one, and did not affect the whole of the scheme. The Company were opposing in order to obtain certain rights to lay gas-mains over the new bridge; but the general rule hitherto had been for Parliament to refuse the right to companies to lay gas and water mains over bridges without the consent of the London County Council or the bridge authority. This had been the decision in the case of Putney Bridge and the new St. Paul's Bridge; and clause 19 of the Bill was the usual one now applied to new bridges. This clause provided that no pipes or mains could be laid on a bridge except with the consent of the Council; and a responsible body like the London County Council could be trusted to exercise discretion in this matter without injustice to other important interests. At the same time, he must point out that there were some exceptions to this general rule. Among them was the case of Vauxhall Bridge, upon which the Gaslight and Coke Company had the right to lay mains in substitution for old rights; and this being so, it appeared to him that the Company would suffer little inconvenience if they did not have the rights over Lambeth Bridge for which they now asked, because the two bridges were very close together. The position with regard to Lambeth Bridge was that in 1862, when the bridge was being constructed by a Company, the Gaslight and Coke Company claimed the right to lay mains, on the grounds that the bridge came within the definition of a public road; and under their powers they had authority to lay mains in all streets dedicated to the public use. This right was disputed; but eventually an agreement was made between the Bridge Company and the Gas Company, giving the latter the right to lay two 18-inch mains on payment of a sum of £3000, and the free lighting of the bridge. It was expressly stipulated in the agreement that the Gas Company did not by this agreement acquire any interest beyond an easement, and there was no obligation on the Bridge Company to maintain the bridge in repair. When the bridge was acquired by the Metropolitan Board of Works, the latter body were unaware of this agreement, and a dispute arose. Subsequently a new agreement was entered into continuing the terms of the old agreement, and therefore the agreement of 1862, to which he had referred, was binding upon the London County Council in respect of the old bridge. The two 18-inch mains had now been upon the old Lambeth Bridge for fifty years. The Company had apparently had full value for their £3000, and the pipes must surely have nearly lived their full life. As a matter of fact, he understood that one of the mains was not used at all. Under these circumstances the London County Council did not think there was any need to have a pipe on the new bridge; but they were willing to provide room for one 18-inch pipe, and to give the Company the same rights in respect of this that they had in respect of the existing pipes. This, he contended, was more than the Company were entitled to. Nevertheless, the Company were apparently asking that the County Council should lay, at their own expense, a new steel main at a considerable cost, instead of the existing rather ancient pipe, and that the Council should enter into a fresh arrangement with the Company in respect of it. This suggestion was considered by the Council to be quite unfair. The Company also raised a number of other points; but it was contended by the Council that these were all met by the Model Clauses which were in the Bill. For instance, clause 9 stipulated that the Council might raise, sink, or otherwise alter the position of, any pipe used for carrying a supply of gas, and make proper substituted works or any alteration, causing as little detriment or inconvenience as circumstances would permit, and making reasonable compensation for any damage caused by such operations. Furthermore, a full seven days' notice had to be given of the County Council's intention to work under this section. It was difficult to see what further protection the Company could require. Another complaint of the Company was that, in the plans of the new bridge, no provision was made for a pipe subway; and although the power to make these was taken in the Bill, it was not at all probable that they would be put into effect—at any rate, when the bridge was built. A point on which he wished to lay stress was that, under the existing arrangement, the Council were not obliged to keep the bridge in repair; so that it seemed to him the Company would be in a better position under the terms now offered than under the present arrangements. Another complaint of the Company was that no provision was made for carrying their pipes during reconstruction. The suggestion apparently was that the Council should erect a separate structure to carry the Company's mains across the river during the construction of the bridge. But this was unreasonable, having in view the proximity of Westminster and Vauxhall Bridges, over which the Company already had mains, which could be used temporarily. Finally, the Company asked for the right to break up the roadway of the bridge; but they did not have this right in any of the other new bridges across the Thames, and the Council asked the Committee not to grant them in this case.

Sir *Maurice Fitzmaurice*, late Chief Engineer to the London County Council, who was responsible for the design of the bridge, was cross-examined by Mr. BALFOUR BROWNE as to the position with regard to the Gas Company's mains. This cross-examination brought out the fact that, under the old agreement with the original Bridge Company, which was continued by the Metropolitan Board of Works, the predecessors of the London County Council, the Bridge Company were under the obligation to maintain the bridge at all times in a sufficient state of repair to carry the Gas Company's mains. Thus, argued Counsel, it was the duty of the London County Council to maintain the present bridge in a sufficient state of repair to carry the Company's mains, even if the bridge was not in a fit state to allow foot passengers over it. But under the present Bill the Gas Company's existing rights would be taken away. The bridge is at present closed for vehicular traffic; but foot passengers are allowed over it. In the course of further questions, it was made clear that at present the Gas Company have the right to lay a 24-inch gas-main over Westminster Bridge; but they would be satisfied with one 18-inch pipe in the case of the new Lambeth Bridge, by reason of the fact that there were mains across Vauxhall Bridge.

Witness said he agreed the only question between the parties was as to who should pay for the new main across the proposed bridge.

Mr. BALFOUR BROWNE replied that the Company had already paid the old Bridge Company the sum of £3000 for the right to maintain two mains across the bridge; and he was content to leave this question to the Committee.

Witness expressed the opinion that the old pipes must surely be regarded as being as dead as the bridge, and that if the Company wished to have the new main they should pay for it.

Mr. BALFOUR BROWNE informed the Committee that in the case of the Vauxhall Bridge no payment was made, and the County Council laid the main; whereas the present Bill absolutely repealed the provisions of the existing agreement. If the County Council desired, they could have one of the existing 18-inch mains in substitution for the new main, which he contended they ought to lay for the new bridge.

Re-examined by Mr. SNAGGE on this point, witness said that the County Council were willing to give facilities for laying one 18-inch main over the new bridge, but refused to provide the Company with a new pipe for this purpose.

Other evidence having been called by the London County Council in respect of the engineering features of the bridge,

Mr. BALFOUR BROWNE addressed the Committee on behalf of the Gaslight and Coke Company, and asked them to see that by the Bill the County Council did not abrogate rights which the Gas Company at present had. He emphasized the point that the Gas Company had a public function, in that they were bound to supply gas throughout their district, and, further, had the right to lay mains on any street (which, it had been held, included bridges) dedicated to the public use. In view of the fact that the Company had already paid the sum of £3000 for the right to lay mains over the old bridge, and that the London County Council were bound to maintain the existing bridge in a sufficient state of repair to carry these mains, he contended that if a new bridge were to be built and the old one taken away, then the County Council should provide a new main over the new bridge at their own expense. In the case of the Vauxhall Bridge, the County Council actually put up a temporary bridge to carry the Company's pipes over the river while the new bridge was under construction; but the Gas Company in the present instance did not ask that this should be done.

No evidence was called on behalf of the Gas Company. Consequently Mr. Vesey Knox, for the County Council, had no right of reply to the Committee.

The Committee then conferred privately, and

The CHAIRMAN subsequently announced that the evidence from the Home Office and the Police on the general question of the desirability, or otherwise of the bridge would be heard the following day. This, of course, does not affect the position as regards the Gas Company.

Wednesday, June 4.

This morning, the Committee, after hearing evidence from the Home Office and the Police, decided that the preamble of the Bill was not proved.

GAS-MAINS AND LEVEL CROSSINGS.

GREAT NORTHERN RAILWAY BILL.

HOUSE OF COMMONS COMMITTEE.—Wednesday, June 4.

(*Before Sir* LUKE WHITE, *Chairman, Major* GASTRELL, *Mr.* AUBREY HERBERT, *and Mr.* FRANCIS MEEHAN.)

This Bill proposes a large number of miscellaneous works in connection with the Great Northern Railway Company's undertaking. The only opposition was in respect of gas-mains over a level crossing at Peterborough, in connection with which the Peterborough Gas Company petitioned.

Counsel for the Bill were Mr. BALFOUR BROWNE, K.C., and Mr. ALLBUTT; and for the Peterborough Gas Company, Mr. G. M. FREEMAN, K.C., and Mr. TYLDESLEY JONES appeared.

Mr. BALFOUR BROWNE stated that the Great Northern Railway Company runs through the town of Peterborough and cuts it in two halves. Formerly there was a level crossing at Cowgate; but in 1911 the Company obtained an Act authorizing them to divert the road leading to this level crossing, and to carry it over the railway by a bridge, simultaneously abolishing the level crossing. This work had been carried out; and in further development of the scheme, the Company now asked for powers to stop up a further part of Cowgate, and to use the land for the purpose of laying new lines. Over the existing lines only slow traffic passed; but when the widening now suggested was completed, fast traffic would pass. Under the spot where the level crossing used to exist the Peterborough Gas Company had two gas-mains—one of 5 inches and the other of 12 inches diameter. The 5-inch pipe had been laid before the railway came upon the scene; but the 12-inch main was laid in March, 1912, with the

permission of the Railway Company. The petition of the Gas Company in regard to the present Bill was that it should be made obligatory upon the Great Northern Railway Company to place these gas-mains in a culvert, and to use such precautions as would prevent injury to them. This the Railway Company objected to absolutely, although they were prepared to consider any scheme to be carried out by the Gas Company for carrying their mains under the widened lines. At the same time, it was not thought that any further precautions would be necessary, inasmuch as the existing mains were placed at a depth of no less than 5 feet below the surface, and hitherto there had been no damage.

Evidence was given by the Engineers to the Railway Company with regard to the nature of the works to be carried out, and this completed the case for the Bill.

Mr. *John Barton* (Engineer of the Peterborough Gas Company), in his evidence, stated that at the time the Railway Company's Bill of 1911 was in Parliament no objection was offered to it by the Gas Company, because the latter were under the impression that it would be possible to carry their mains over the bridge. But when they made the application, the Railway Company refused, and they were compelled to go under the level crossing. The position now, however, was quite different, because hitherto only slow traffic had been passing over the mains, and consequently there had been no ill-effects from vibration. But when the land which it was proposed to take was converted into a railway track, fast traffic would be passing over it, and consequently the risk of damage would be very much greater. Therefore it was only fair that the Railway Company should put the Gas Company's mains in a culvert, in order to prevent any damage from vibration. Any possibility of damage to the mains would be most serious to the users of gas, because it would mean that one portion of the city would be deprived of a supply until the damage was repaired. Another point which the Gas Company made was that the Railway Company were now stopping up a portion of a public road in which at present the Gas Company had the right to lay mains; and they asked for similar rights if the Bill passed.

Mr. FREEMAN, addressing the Committee on behalf of the Gas Company, admitted that a mistake was made in not opposing the Railway Company's Bill of 1911; and he was going to ask the Committee in the most open and explicit manner not to saddle the public with the risk of a breakdown in supply through the oversight of the Gas Company in not opposing the 1911 Bill. The crossing of the railway by the Gas Company's mains at this point was the only means of communication between the gas-works and the other portion of the city, and, as had been pointed out in the evidence, the risk of damage to the mains would now be considerably greater, owing to the existence of the fast traffic which it was proposed to run over them. With regard to the second point made by the Gas Company, he would ask the Committee to be allowed to exercise all the rights which the Gas Company now had over this main street, although under the Bill a portion of it would cease to be a public street.

Mr. BALFOUR BROWNE replied briefly on behalf of the Railway Company, and urged that it was not usual for other people to have free rights over private property to lay mains, and that in all cases it was necessary for the property owner's consent to be obtained.

The Committee deliberated in private.

The CHAIRMAN subsequently announced that their decision was in favour of the Railway Company, and added that with regard to the 12-inch main there was no statutory obligation on the Great Northern Railway Company to have allowed the Gas Company to place this under the railway; but he understood that this 12-inch main would be allowed to remain. This being so, the Committee did not think they could place the Great Northern Railway Company under a statutory obligation to do what the Gas Company had asked.

PROGRESS OF SUNDRY PRIVATE BILLS.

The following Bills were before various Committees of Parliament during the past week, and were sent forward for third reading.

Broadstairs and St. Peter's Urban District Council Bill.—This Bill is an omnibus measure; but Part V. deals with the Council's water undertaking. This was unopposed, as the clauses in this section merely consist of provisions for the better management of the undertaking—such as the exemption of fittings from distress, power to the Council to repair communication pipes, &c.

Local Government Provisional Orders (No. 1) Bill.—In this Bill are the following: (1) Chorley Urban District Council Order, which increases the Council's borrowing powers under their Act of 1907 from £25,000 to £125,000. (2) Filey Urban District Council Order, by which the additional land for gas purposes is authorized. (3) Neath Urban District Council Order, in which additional lands for gas purposes is authorized, and the borrowing powers under the Order of 1893 are increased from £20,000 to £100,000. (4) Newton-in-Makerfield Urban Council Order. In this case, it is provided that the Council may apply, in aid of a general improvement rate, so much of the profits from the gas undertaking as may not be required for the purposes of the undertaking each year; but no portion of the profits may be applied to the relief of rates when the price of gas supplied to consumers, otherwise than through prepayment meters, exceeds 3s. per 1000 cubic feet.

Local Government Provisional Orders (No. 3) Confirmation Bill.—This Bill includes: (1) Ashton-in-Makerfield Urban District Council Order, by which the Council are authorized to use additional lands for the purpose of their gas undertaking, including the manufacture and storage of gas and residual products. Powers are also given to borrow additional sums for the purpose of the gas undertaking, subject to the sanction of the Local Government Board. (2) Rochdale Corporation Order. In this case, the following clause is authorized to take the place of section 7 of the Rochdale Improvements Act of 1872:

> The Corporation may purchase or hire and sell, or let on hire, supply, and otherwise deal in, and fix, set up, alter, repair, remove, and refix, but shall not manufacture, any gas-fittings, and may require and take such remuneration in money or such rents and charges for, and make such terms and conditions with respect to the sale, letting, supply, fixing, setting-up, altering, repairing, removing, or re-fixing, of such gas-fittings, and for securing their safety and (if the circumstances so require) their return to the Corporation as may be agreed upon between the Corporation and the person to or for whom the said gas-fittings are sold, let, supplied, fixed, set up, altered, repaired, removed, or re-fixed.
>
> Any gas-fittings let for hire under the provisions of this section shall not be subject to distress, or to the landlord's remedy for rent, or be liable to be taken in execution under process of any court or any proceedings in bankruptcy against the persons in whose possession the same may be: Provided that such fittings are marked or impressed with a sufficient mark or brand indicating the Corporation as the actual owners thereof.
>
> For the purposes of this section, the expression "gas-fittings" includes any meter, engine, oven, stove, range, pipe, or burner, or any other apparatus, appliance, article, or thing used, or intended or adapted to be used, in, or in connection with, the supply or consumption of gas for the purposes of lighting, motive power, heating, and cooking, or for any other purpose for which gas can or may be used."

(3) Stratford-upon-Avon Urban District Council Order, in which the use of additional lands for the purposes of the gas undertaking, including the manufacture and storage of gas and residual products, is authorized.

Local Government Provisional Orders (No. 4) Confirmation Bill.—This Bill includes the (1) Briton Ferry Urban District Council Order, in which additional lands are scheduled for gas purposes. (2) The Cleckheaton Urban District Council Order, where additional borrowing powers to the extent of £50,000 are granted for the purposes of the gas undertaking. (3) The Workington Urban District Council Order, giving authorization for the purchase of additional lands for the purposes of the water-works.

Local Government Provisional Orders (Gas) Bill.—In this Bill is included the Biddulph Urban District Council Order, which authorizes the purchase by the Biddulph Urban District Council of the Biddulph, Bradley Green, and Black Bull Gas Company, and gives the Council all the powers of a gas authority. The maximum price is 5s. 6d. per 1000 cubic feet, and the candle power 14.

Local Government Provisional Orders (No. 7) Confirmation Bill.—This Bill includes the following: (1) Manchester Corporation Order, which authorizes the additional borrowing powers for the supply of water for hydraulic power purposes, with the sanction of the Local Government Board. Under the Corporation's existing Acts and Orders, these powers are limited to £150,000 for this special purpose. (2) Wombwell Urban District Council Order, which authorizes the manufacture and storage of gas and residual products upon additional lands, and brings the previous legislation obtained by the Council up to date in the matter of sinking fund arrangements, and powers to re-borrow, together with the method of disposal of the profits.

Lothian Railways Bill.—This Bill, which proposes the construction of a new railway line into Edinburgh from the Lothian coalfields, was before the House of Lords Committee presided over by Earl Kintore. Among the witnesses who were called in favour of the Bill was Mr. W. R. Herring, who spoke as to certain difficulties experienced at present due to the insufficiency of the trucks provided by the existing railway companies. Mr. Herring expressed the opinion that the existence of this competing line would greatly facilitate the coal supply of Edinburgh, and would no doubt reduce the present charges for carriage.

Silloth Gas Bill.—This Bill, ordered last Thursday to be reported by the Unopposed Bills Committee of the House of Commons, empowers the Holme Cultram Urban District Council to purchase the gas-works of the North British Railway Company, which are situated in the Silloth Ward of the district. The parties have agreed upon a purchase price of £2400 for the works, buildings, and plant, except such of the mains, pipes, meters, lamps, and other apparatus as are upon the railway and dock works of the Company at Silloth. The Bill gives the Council the usual clauses common to modern gas legislation. The illuminating power of the gas is to be 14 candles, and the maximum price 5s. 6d. The present net revenue from the undertaking is £255, from which will have to be deducted £148 for interest and sinking-fund charges. As a matter of fact, the Company are at present charging 5s. 8d. per 1000 cubic feet; but as under the Bill the maximum is 5s. 6d., an immediate reduction of 2d. per 1000 cubic feet is, of course, to be made. As originally drafted, the Bill proposed a period of forty years for the repayment of the loan necessary for the purchase of the undertaking; but this has now been reduced to thirty years. The other money powers in the Bill are £500 for working capital and £1000, repayable in twenty years, for the reconstruction of mains.

South Staffordshire Mond Gas Bill.—This Bill authorizes the South Staffordshire Mond Gas (Power and Heating) Company to issue one-half of the share capital mentioned in the Company's Act of 1901 as £10 preference shares, to vary an agreement with Dr. Ludwig Mond, to redeem the 5 per cent. debenture stock by agreement with the holders, and to establish a co-partnership scheme and a benefit fund for the employees.

United District Gas Bill.—This Bill has for its object to reincorporate the existing Limited Company as a Statutory Company, and to work the existing gas-works at Bicester, Buckingham, Adderbury, Cricklade, and Woodford, in the Counties of Oxford, Buckingham, Wiltshire, and Northampton. The capital of the Company is £48,000, and powers are given to raise additional capital not exceeding £9660, with the usual one-third borrowing powers. The first directors of the Company are Messrs. F. C. Heffer, C. J. Heffer, W. C. Parkinson, W. J. Peppercorn, W. A. Schultz, and H. C. Walker. The standard price is 4s. 6d., and the candle power 14. The Bill contains the usual clauses in modern gas legislation.

METROPOLITAN WATER BOARD (VARIOUS POWERS) BILL.

HOUSE OF LORDS COMMITTEE.—Wednesday, June 4.

(*Before Lord* CLINTON, *Lord* ST. LEVEN, *Earl* LOVELACE, *Viscount* BARRINGTON, *and Lord* STANMORE.)

This Bill proposes a number of new works in different parts of the Metropolitan Water Board's area of supply, including new conduit lines, reservoirs, and pumping-stations in Middlesex and Kent, and certain narrow-gauge railways for the purposes of their undertaking at Hampton. Borrowing powers of £1,250,000 are proposed.

Mr. J. D. FITZGERALD, K.C., Mr. VESEY KNOX, K.C., and Mr. COURTHOPE MUNRO appeared for the promoters; while Mr. G. M. FREEMAN, K.C., Mr. JEEVES, Mr. WROTTESLEY, and others appeared for various petitioners.

Mr. FITZGERALD said there were originally 54 petitioners against the Bill; the point objected to being with regard to clauses 61 and 64. Most of this opposition had, however, now disappeared, as clause 61 had been withdrawn and clause 64 modified. He would, however, deal with them in due course. There was only one work that was objected to by any landowner, and that was the construction of a service reservoir and pumping-station near Woolwich. Otherwise, except general observations or matters of this sort, there was no specific objection to any of the proposals. There was, however, in Part II. of the Bill, work of a different character at Hampton, where there were considerable works and pumping-stations belonging to the Board; while about two miles distant there were works and pumping-stations close to Kempton Park, which consumed a considerable amount of coal. It was proposed to erect a wharf and landing stage on the Thames close to the Hampton works, for which they had made satisfactory arrangements with the Thames Conservancy. It was then proposed to have a small railway of 2-feet gauge running from the wharf, first to the Hampton works, and then on to the Kempton Park works. The only supply of coal to the Kempton Park works at present was by railway, as it was not possible to obtain it by river. It is now intended to get the coal up to the wharf by water, and then convey it by small waggons along the narrow-gauge railway both to Hampton and Kempton Park. This would be a considerable convenience to the Water Board, and would involve great saving in expense, and, in addition, would relieve the roads both from the amount of traffic passing over them, and also from the nuisance which was caused by coal falling off the carts in which it was at present conveyed. The construction of the railway, however, would involve passing over two roads between the Hampton and Kempton Park works. One of these roads was the Lower Sunbury Road, and the other an occupation road. The railway also had to cross another road; but here it was now proposed to cross by means of a tunnel. The carrying of the railway over or under the first two roads mentioned would cost the Board something like £10,000. It was suggested to construct an ordinary level crossing; but to this the Commissioner of Police had objected, on the ground that it would cause danger to the public. Mr. Fitzgerald pointed out, however, that the traffic would be very slow compared with that on ordinary level crossings. It was proposed to always employ a watchman at the crossing on the Lower Sunbury Road; whereas on the occupation road it was not thought necessary except on race days at Kempton Park, when there were a number of motor-cars and other traffic passing on the way to the course. Sir Horatio Yorke, of the Board of Trade, moreover, had reported with regard to this railway, and recommended that it should be constructed. There were also, at Kempton Park, some 60 acres of land to be acquired for filter-beds. Counsel then referred to the petition of Mr. Godson, on whose land it was proposed to erect a reservoir and pumping-station near Woolwich. Mr. Godson was the owner of some property, comprising about 50 acres, on the edge of Eltham Common, known by the name of Castle Wood. This estate Mr. Godson had acquired in 1883, and had since spent large sums of money on it. Mr. Godson objected on the ground that the reservoir and pumping-station would depreciate the value of his estate, and maintained that if the Board bought a portion of the land they ought to acquire the whole, as this was the general law. Counsel pointed out that the reservoir and pumping-station would be beyond the view of the house and right on the boundary of the property, and on land that has been advertised for building purposes for some time. Mr. Godson also objected to the period inserted in the Bill for completing the works (15 years), and saw no reason why his house should be rendered uninhabitable for this period. Counsel, however, pointed out that if this were so he could claim compensation. The petitioner also objected to clause 29, which was to the effect that owners may be required to sell to the Board parts only of certain lands and buildings. This, however, was an ordinary clause, and had been inserted in Bills by Parliament for the last thirty years. It was absurd that the Board should be compelled to buy the whole estate of 50 acres simply because they wanted to use half-an-acre on the extreme edge. If this were so, it would mean that improvements for the supply of water would be impossible.

Mr. *William B. Bryan*, the Chief Engineer to the Metropolitan Water Board, was then called, and examined by Mr. MUNRO with regard to the proposed works.

Mr. FREEMAN, in cross-examining witness with regard to Mr. Godson's property, said that the property was known as Castle Wood, situated on the south side of Eltham Common, comprising about 50 acres, and was in an exceptionally charming situation. The house was on a high elevation, with the land sloping away from it. Considering its distance from London, Counsel regarded Castle Wood as a unique property. Witness did not think, however, the pumping-station would cause any depreciation of the property, as there would be no chimneys or boilers. The motive power would either be by electricity or internal combustion engines. He maintained that the pumping-station would not be seen from the house, as the intervening trees would hide it. Counsel made the point that the general law was that if the Board wished to buy a portion of the land they should buy the whole, if the owner required them to do so; and he maintained that the Board were asking Parliament to exempt them from this law. The soil was not very stable in the neighbourhood, consisting of clay and gravel; and Counsel pointed out that if the reservoir was constructed, the ground was liable to shift, and so cause the reservoir to leak, and the leakage would go over the other land on the estate, and so depreciate the value of it. Witness did not agree, however, as he said the reservoir would be constructed on the low-lying part of the property, on a slope, and the water, if such leakage occurred, would follow the slope of the land. With regard to the time allowed for completing the works, he estimated that this particular portion could be completed in four years; and he did not think the Board would object to this period for the work.

Mr. *Harold Oxley*, Surveyor to the Metropolitan Water Board, was also called in support of the Bill.

Mr. FREEMAN, addressing the Committee on behalf of Mr. Godson, again referred to the general law, and urged the point that the Board should be compelled to buy all the land if the owner so desired.

The CHAIRMAN said that the strictness of the law in this connection often caused inconvenience, and that it was the practice in some Bills to insert a clause relaxing the general law.

Mr. FREEMAN admitted that this had been done in many instances, but said that every case should be considered on its merits; and he hoped the Committee would favourably consider his point. He remarked that if the works were not going to do any harm to the estate, why should the Board be afraid of acquiring the whole, rather than a private individual should take the risk and chance of having his estate depreciated in a case in which he had had no voice? He asked that the law should be allowed to take its course, as he did not not see any special reason for Mr. Godson having this burden put upon him.

Mr. *J. W. Restler*, the Deputy Chief Engineer to the Board, then gave evidence with regard to the railway at Hampton. The present coal consumption at Hampton and Kempton Park was 40,000 tons and 11,000 tons per annum respectively. The coal used at Hampton was brought up the river by barge, and carted from there to the works along the Lower Sunbury Road. Witness stated that the Hampton authority agreed entirely with the scheme, owing to the nuisance caused to the roads by the falling of coal from the carts. In Colonel Yorke's report, he said the traffic on the Lower Sunbury Road is not heavy, and that the occupation road referred to had practically no traffic except on race days. In answer to a query from the Chairman, witness stated that two trains each way per hour would be quite the maximum traffic on the railway.

Mr. WROTTESLEY, for the Middlesex County Council, cross-examined with regard to the up-keep of the third road under which a tunnel is to be constructed for the railway—as to whether it should be maintained by the County Council or the promoters.

The CHAIRMAN suggested, however, that this construction of the tunnel would put no additional burden on the present maintainers of the road.

Mr. *E. Cozens*, the Clerk to the Hampton Urban District Council, was called in support of the proposed landing stage and railway.

Mr. FITZGERALD then addressed the Committee with regard to the new clause 64 which deals with fire hydrants. This reads as follows:

> (1) For the purpose of section 73 (as to apparatus for supply of water in case of fire) of the "Metropolitan Water Board (Various Powers) Act, 1907," all such fire plugs, hydrants, and other apparatus in the district of any local authority as may be specified in a list deposited with the Board by that local authority on or before the first day of July, 1914, as being required for the supply of water for extinguishing fire, shall be deemed to have been fixed at the request of that local authority, and the provisions of the Water-Works Clauses Act, 1847, relating to the maintenance of fire plugs, fixed at the request of the town commissioners, shall extend and apply to all such fire plugs, hydrants, and other apparatus as may be specified in any such list, and to any hydrants or other apparatus substituted therefore by the Board under the powers of the said section 73.
>
> (2) All fire plugs, hydrants, and other apparatus, elsewhere than in the Administrative County of London, fixed for the supply of water for extinguishing fire, which shall not be specified in any such list as aforesaid, and shall not have been placed by the Board or their predecessors in title, pursuant to the provisions of section 41 of the Water-Works Clauses Act, 1847, shall be deemed to have been fixed otherwise than at the request of the town commissioners or the local authority, and accordingly to be removable by the Board if they think fit, but without prejudice to the right of any local authority at any time after the said first day of July, 1914, to require the Board, pursuant to the provisions of section 38 of the said Act as amended by the said section 73, to fix hydrants or other apparatus in any main or pipe of the Board in the district of that authority.

Mr. *Restler* was again called to explain to the Committee the improvements that have been effected by substituting new fire hydrants for the old wooden plugs.

There was considerable discussion as to who should pay for the up-keep of these fire hydrants—the local authorities or the Water Board. This clause was opposed by a large number of local authorities, as the Water Board, under the new clause, propose to place the expense upon the local authorities.

Thursday, June 5.

On the resumption of the proceedings this morning,

The Committee decided to pass clause 64, subject to the provision that the local authorities should only be required to replace 10 per cent. of the hydrants or fire plugs each year.

The Committee then consulted in private on the question of Mr. Godson's opposition.

The CHAIRMAN subsequently announced that the Committee found the preamble was proved in respect of the taking of this land, subject to a limitation to two years of the period during which the right of purchase would continue, and the construction of the works to four

years, instead of 7 years and 15 years respectively. This was, of course, if the works could be completed in this time.

The consideration of clauses takes place to-day (Tuesday), when the police objection to the new railways at Hampton will be dealt with.

Incidentally it may be mentioned that the promoters have reduced the period of sixty years within which the Bill, as drafted, proposed to repay the loan for the construction of works and purchase of land to fifty years.

LEGAL INTELLIGENCE.

UNPROFITABLE ELECTRIC LIGHTING AT LIMERICK.

Appeal against the Rates.

At the Limerick Quarter Sessions, a few days ago, Judge LAW SMITH heard an appeal by Mr. M. O'Brien, a member of the Corporation, against the improvement rate for the half year ending in March last; the object being to have quashed the rates which were intended to meet a deficit on the electric light undertaking.

It was explained that under their Provisional Order the Corporation had power to charge up to 8d. per unit for current, and until this figure was reached the Order did not contemplate that any charge should be made on the rates. There was no reserve fund, and the maximum charge was not being made. It was not fair, said Mr. D. T. SHERLOCK, B.L. (for Mr. O'Brien), to ask the general body of the ratepayers to pay this rate. Out of 7000 ratepayers, only 267 were users of electricity. The charge for current was 5d. per unit, with discounts varying from 5 to 20 per cent.; and the loss on the working in the last financial year amounted to £1576.

Mr. *O'Brien* said the sum borrowed to instal the system was £34,500; and the loss up to the present reached £15,700. The charge of 5d. per unit, with the discount stated, was too low having regard to the annual loss. When the Electric Light Department was created, the staff numbered only four; but now there were twenty. The electricity undertaking cost the rates £17,000, which he attributed to mismanagement and other causes. He wanted to have a price fixed that would make the concern pay its way. He suggested 6d. per unit, and a reduction of discount to 10 per cent.

Mr. KELLY, B.L. (for the Corporation), contended that the Act relating to the case was, like the National Insurance Act, intended for the good of the community at large, and not for individuals.

Judge LAW SMITH said Mr. O'Brien had discharged a useful public duty in bringing the case forward. He agreed that the Electric Light Committee were not entitled to create an artificial deficit, as had been done in this instance. The rate, no doubt, was struck with a good intention, and for a good purpose; but he believed the Corporation had overstepped the limits imposed by Parliament. He quashed the electric light rate, and allowed Mr. O'Brien his costs.

DISPUTED CHARGE FOR WATER AT NUNEATON.

An Overlooked Agreement.

In the Court of Appeal a few days ago, Lords Justices Vaughan Williams and Hamilton and Mr. Justice Bray were engaged in hearing an appeal by the Nuneaton Corporation from a judgment of Mr. Justice Bailhache upon a special case which raised the question as to whether the Arbitrator in certain proceedings was right in awarding the respondents, Messrs. Stanley Bros, Limited, a sum of £1426 claimed as having been overpaid for water under a mistake. His Lordship's judgment was given in the "JOURNAL" for the 26th of November last (p. 690).

The facts were somewhat peculiar. The claimants were owners of a colliery and brick and tile works at Stockingford, for which they required water. The Nuneaton Corporation were the undertakers for the supply of water within the limits of the borough, and by an agreement entered into in 1900 between the Company and the Corporation, it was agreed that, in the event of the former being unable to obtain sufficient water for the purposes of their works from all their available sources of supply, the Corporation would supply them at cost price, not exceeding 2d. per 1000 gallons. The supply from available sources proving insufficient for their requirements, from the date of the agreement until June 30, 1910, they used over 81 million gallons of Corporation water. They did not, however, call upon the respondents to supply them at the above-named rate, but paid the usual charge of 8d. per 1000 gallons. The Company, in 1910, then found out that they had been paying more than the price fixed under the agreement, the existence of which, in fact, had been overlooked; and the question then arose as to whether they could enforce it, and so get back the 6d. difference between 2d. per 1000 gallons and the ordinary charge. The matter went before Mr. C. C. Hutchinson for his decision, and he found that the claimants were, during the period between June 24, 1900 (the date of the agreement) and Dec. 30, 1909, when they discovered their rights under the agreement, *bonâ fide* ignorant of the existence of legal rights of any nature or extent at all which entitled them to require that the Corporation should supply them with water at 2d. per 1000 gallons. The Arbitrator stated a case for the opinion of the High Court, asking whether, upon this finding of fact, the claimants could get the difference repaid, and (if so) whether the claim was barred by the Statute of Limitations after six years. Mr. Justice Bailhache held that the Company were entitled to the £1426 claimed, and the Corporation appealed.

Mr. HUGO YOUNG, K.C. (Mr. BETHUNE and Mr. DEIGHTON POLLOCK with him), contended that the decision in favour of the claimants was wrong, because the mistake was a mistake of law, and the old maxim that "ignorance of law excuses no man" applied. At any rate, he claimed that the Corporation were protected by the Statute of Limitations against any claim for money paid prior to October, 1904.

Mr. JOY (with him Mr. EALES), for the Company, said it was agreed that, in the event of the colliery owners being unable to obtain a sufficient supply of water, the Corporation would supply them at 2d. per 1000 gallons. When asked to refund, the Corporation said the money, though paid by inadvertence, as found by the Arbitrator, was nevertheless money paid under a mistake of law and not of fact, and further that the Statute of Limitations applied.

Lord Justice VAUGHAN WILLIAMS, in giving judgment, said the Arbitrator left four questions to the Court: (1) Upon the construction of the agreement, were the Corporation liable, in the event of the Company being unable to obtain from all their available sources sufficient water for the purposes of their works, to supply the Company with water at cost price, not exceeding 2d. per 1000 gallons, to the extent that the Company might be unable to obtain sufficient water from their own sources—such supply being given through and taken from the water mains of the Corporation vested in and used by them as the water undertakers for the Borough of Nuneaton? (2) Were the Corporation bound to supply the Company to the extent that they were unable to obtain sufficient water for some or any of the purposes of their works by reason of any defect in the quality thereof? (3) Whether what the Company had paid in excess was paid under a mistake of law or a mistake of fact. (4) Whether the Statute of Limitations applied. In his Lordship's opinion, the water to be supplied by the Corporation was to be "commercial water," and therefore their duty to supply was not limited to pumping water into the Company's reservoirs. But he thought Mr. Justice Bailhache had wrongly decided the second question, and that the liability to supply only arose by failure of quantity and not of quality from their own sources. He also was of opinion that the money paid was paid under a mistake of law. He was content, however, to hold that the appeal must be allowed, because, in his opinion, no liability to supply at the lower rate arose unless and until the Company gave notice to the Corporation that their own supply was exhausted, and they required water for their brick and tile works and colliery. No such notice had been given, and therefore the Company were not in a position to require repayment, but must pay for the supply they had had just as any other ratepayer who took water from the Corporation. In this view of the case, it became immaterial to consider whether the Statute of Limitations prevented the Company getting back payments for more than six years, because, in his opinion, they could get back none of the money they had paid for water.

Lord Justice HAMILTON and Mr. Justice BRAY concurred.

The appeal was accordingly allowed, with costs. No costs were given to either side with respect to the trial; and the costs of the arbitration are to be decided by the Arbitrator.

MISCELLANEOUS NEWS.

OLDBURY'S NEW GASHOLDER.

Inauguration Ceremony.

There was an interesting gathering at the Oldbury Gas-Works last Tuesday afternoon, to witness the completion of the erection of a new spiral-guided telescopic gasholder, and the formal ceremony of turning on the gas supply, which was performed by Mr. B. T. Sadler, one of Oldbury's earliest public men and a gentleman who was many years ago prominently identified with the undertaking. Among those present were Messrs. J. W. Wilson, M.P., H. Jefferies, the Chairman of the Council, C. Thomlinson, the Chairman of the Gas Committee, and A. Cooke, the Gas Manager.

Mr. THOMLINSON (the Chairman of the Gas Committee) first gave a hearty welcome to all to the gas-works. He explained that Oldbury was originally supplied with gas from the Swan Village works of the Birmingham Corporation. On Dec. 31, 1881, Mr. B. T. Sadler, the Chairman of the Oldbury Local Board at that time, together with Mr. Arthur Wright, their Clerk, and Mr. Anderson, their Treasurer, took a cheque over to Birmingham to pay the Corporation for the transfer of the gas-works to them. Works were built at Oldbury consisting of two retort-houses, to meet an output of 40 million cubic feet per annum. Mr. Fred. J. North was appointed their first Gas Manager; and in less than two years he had to undertake the rebuilding of the whole of the retort-benches, and the telescoping of both holders. The capacity of the two holders was then 450,000 cubic feet. Mr. North left the works in 1885 (having secured an appointment in Brazil), and he was succeeded by Mr. Charles Meiklejohn, who, in 1892, was appointed to the Rugby management. Then Mr. Cooke, who had been at the gas-works since the commencement of the undertaking, applied for the position of Gas Manager. The Committee considered he was a fit and proper person to receive it; and they accordingly appointed him. Since then there had been great alterations and extensions under his management. They had introduced carburetted water-gas plant at a cost of £7000, and had spent £2350 on new regenerative furnaces in the retort-house; and the recommendation of their Manager in this direction they found a sound and economical one. Then Mr. Cooke pointed out to the Committee that their purifying plant was not up to date, and new purifiers were introduced. This was followed by the purchase of a Holmes washer of 1,000,000 cubic feet capacity, and a sulphur cyanide washer. For the alterations and improvements at the works great credit was due to their Manager. Mr. Sadler had the honour of turning on the gas when the first Oldbury works were opened; and they were pleased to have him with them again. The new spiral holder, which had undergone a severe test, had a capacity of 500,000 cubic feet.

Mr. B. T. SADLER then turned on the gas, and remarked that when

he took Oldbury's cheque for £22,400 to Birmingham they declined to accept it, and their Treasurer had to tender Bank of England notes. At the time they purchased the gas undertaking, some people thought they were going to ruin the ratepayers: but he was pleased to say this had not been the case. He was delighted with the wonderful progress the concern had made.

Subsequently luncheon was provided at the works.

Councillor C. THOMLINSON presided, and gave the loyal toast.

The Right. Hon. J. W. WILSON, M.P., followed with "Success to the Contractors, Messrs. Walker and Vale." It was with great pleasure he joined with them in celebration of such an important occasion, for he felt they had in the erection of the new holder made the position of the gas-works secure for some time to come. The work of the erection of the new holder had been ably carried out, and the anxieties of the Gas Committee in meeting the growing public demand were now at an end. He was glad to feel that the prosperity of Oldbury, as well as that of the gas-works, had never been greater than it was at the present time.

Mr. R. J. MILBOURNE replied on behalf of Messrs. C. & W. Walker, Limited, who erected the holder, and said that future generations would be able to reap the benefit from the wisdom and foresight of the present Gas Committee. He mentioned that in connection with the new holder there was a quarter of a mile of spiral guides; the weight of the tank was 171 tons; the weight of the holder's two lifts was 178 tons; 4539 bolts and nuts were used; 55,916 rivets were used in the tank, and 207,844 in the holder; and there were 1,848,000 gallons of water in the tank. The Gas Committee started the erection of the holder when prices were at rock-bottom, and it had been completed when prices were at the top; so they could take some credit to themselves that in this matter they had effected a saving of between £400 or £500.

Mr. VALE also replied, and congratulated the Engineer upon the successful completion of the work.

Mr. MILBOURNE next proposed the toast of "The Oldbury Urban District Council," and said he always thought gas-works were a very good indication of what a town was. Anyone who visited the gas-works must be impressed with the state in which they were kept and the up-to-date character of the apparatus installed.

Mr. HERBERT JEFFERIES (the Chairman of the Council), in replying, said Oldbury was in the unique position of being able to supply gas for power purposes as cheaply as any other town in the country. Practically the gas was supplied at cost price, without taking into consideration anything for establishment charges. This was done to encourage trade; but it looked as if the other consumers were paying for it. He believed that Oldbury had an assured prosperity, and they had a better outlook than they had had for years. In this work the Gas Committee had provided for many years hence; and he hoped all departments of the town would be run on strict business lines.

Mr. Cooke (the Gas Engineer) then presented each guest with a large photograph of the holder—one of the most up to date—and he also produced a photograph of the first gasholder in the world, which was erected at Soho.

Mr. COTTERELL (of Messrs. C. & W. Walker, Limited) proposed the health of "The Chairman;" Mr. THOMLINSON responding.

Mr. COOKE submitted "Neighbouring Gas Authorities," and

Mr. HAROLD E. COPP (West Bromwich), in responding, said Mr. Cooke was the first friend he made when he came into the district ten or twelve years ago, and he had always valued his friendship. He considered the Oldbury gas undertaking was a thoroughly sound and flourishing one; and in making extensions money had been well and wisely spent.

The work of erecting the gasholder was carried out under the supervision of Mr. John Monk.

GAS MANAGEMENT AT ILKESTON.

Violent Recriminations.

[FROM OUR LOCAL CORRESPONDENT.]

Further "fierce light" has within the last few days been thrown upon certain matters connected with the management of the Ilkeston Corporation gas undertaking; and the acrimony which has been engendered by recent debates in the Council appears likely to become accentuated with the opportunity which is now promised for continued discussion. Following the unfortunate disaster which resulted in the demolition of a new spiral-guided gasholder came a Government inquiry for authority to borrow more money for gas-works extensions, leading to an elucidation of unwonted incidents which resulted in the original plans being departed from without the authorities being made cognizant of the change, and causing the Inspectors who conducted the investigations to describe the process as being one of "hoodwinking" the Local Government Board. The appointment of a new Engineer and Manager, with the relegation to a secondary position of Mr. F. C. Humphrys, who had for years been responsible for the control of the undertaking, formed another stage in the course of events, which later brought within their train Mr. Humphrys' entire withdrawal from the municipal service with which, for the greater part of his professional career, he had been associated. It was thought that with the voting of £450 to Mr. Humphrys as a not too liberal *solatium* for the Committee's acknowledged *faux pas*, of which he had been made the scapegoat, possibly the last had been heard of the matter; but the eruption which has been periodically in evidence since the inner circumstances were made public property assumed greater activity than ever last Tuesday, when the subject was again before the Council. There was a proposal that the question should be dealt with in private; but to this strong objection was raised.

Mr. SMITH contended that there had already been sufficient "hole-and-corner" work regarding Mr. Humphrys' case. Two private meetings had been held; and he submitted that in thus dealing with the matter behind closed doors they had withheld from Mr. Humphrys that which was a common right—a public hearing. Mr. Humphrys had been tried and condemned in private, and he had been humiliated in the dust, while great sorrow had been laid upon his family. Why should the Council be afraid of dealing with the matter in public, if they felt they were justified in acting as they had done? It was only fair that the public should know both sides of the question; and for this there was a loud demand on all sides. What had this old official done that he should be treated as a common criminal? The speaker defied anybody to say a solitary thing which would warrant the treatment that had been meted out to their former Gas Engineer.

Mr. MACDONALD replied that it was evident Mr. Smith did not know the facts which the Gas Committee had in their possession; and it was undesirable that the matter should be discussed in public.

Mr. WOOLLEY urged, however, that it was necessary that the whole business should be dealt with publicly, or an erroneous impression might be created, leading people to infer that certain members of the Council had done something upon which they were afraid the light of day might be thrown. Hitherto he had been willing, because of the respect he entertained for Mr. Humphrys, that the matter should be dealt with in private. He certainly desired to protect him as far as he could; but he should now certainly resent it going before the public that he (Mr. Woolley) had been a party to some dirty work which he was afraid should be made known.

Mr. SMITH: You know you have condemned the man and ruined him.

Mr. MITCHELL inquired whether it was true that members of the Finance Committee had refused, for fear of being surcharged, to sign a cheque for £450 for Mr. Humphrys, representing the grant to be made to him of three years' salary upon the basis of the reduced scale after his appointment as Assistant-Engineer.

Alderman H. MOSS stated that there had been no cheque presented at any meeting of the Finance Committee which he had attended. He added that he should like to support Mr. Humphrys as he always had done, and he thought it would be better for him that the matter should be debated in private.

Mr. SMITH declared that if it was taken in private he would next day announce it from the housetops.

Alderman SUDBURY said that, in the interest of the Council, he should prefer to deal with the matter in public; but if they wished to do the best for Mr. Humphrys, he urged them to discuss it privately.

Alderman SCATTERGOOD said the general public needed more light upon the subject. His opinion was that the gentlemen who had the matter in hand had not done the best for Mr. Humphrys; but he believed the predominant feeling of the ratepayers was to know more about it. He was surprised at the proposal to vote £450 to the former Engineer, as it was a large sum, and they could not afford it.

It was then determined, by eleven votes to six, that the discussion upon the Committee's report should be proceeded with in public.

Mr. WOOLLEY moved that the confirmation of the minutes be adjourned to afford Mr. Humphrys an opportunity of attending before the Council. They had been browbeaten because they had not given the man a chance.

Mr. NOON asked whether the interview would take place in public.

The MAYOR: It will be for the Council to decide that.

Mr. SISSON suggested that Mr. Humphrys should be allowed to come and the public to hear what he had to say for himself.

Mr. WOOLLEY said his sole object was to clear away the aspersions which had been cast upon members of the Council. They had been accused of treating Mr. Humphrys diabolically; but they had characters, and must demonstrate that their action had been far different from what had been pictured. He did not see, however, what Mr. Humphrys was going to gain.

Mr. SUTTON seconded the proposal in favour of discussing the whole matter in public. Speaking with authority, he could say that Mr. Humphrys was perfectly satisfied with the arrangement which had been attempted to be carried out.

Mr. SMITH suggested that a solicitor should be allowed to represent Mr. Humphrys when he came before the Council.

Mr. SHAW opposed the proposal; saying that if Mr. Humphrys liked to attend well and good, but it ought to remain at that.

Mr. MACDONALD expressed doubt whether Mr. Humphrys would attend. He thought that the Gas Committee, backed up by the Mayor and his brother, had been the best friends of the late Gas Manager for the manner in which they treated him after the inquiry. If he reported to the Council the information which he had in his possession, it would irretrievably damage Mr. Humphrys. Mr. Humphrys did not inform them that, as an outcome of the visit of the Government Inspector, they would be told that the gasholder in question was never sanctioned—in plain English, that the Local Government Board had been "tricked." Mr. Humphrys must have been aware that the day would come when the Board would reopen the matter, because the expenditure could not be legalized without some action upon the part of the Corporation to get the expenditure sanctioned. He must have been cognizant of the fact that some day or other he would have to be called to account, because, as the Engineer who was responsible for carrying out the scheme, in the event of anything ulterior occurring, the Local Government Board would lay the responsibility for this business upon the official who was paid to see the work through, and put his name to the plans and specifications that were submitted to them. The announcement of the Town Clerk that, because of an accident in another part of the country where some men had been killed, the Home Office would probably direct an inquiry to be held into the circumstances connected with the Ilkeston gasholder explosion, came at an unfortunate moment—when the Council were engaged in making a claim upon the Insurance Company. It was then absolutely necessary that they should have some information to guide them; but at the meeting which followed they had no assistance from Mr. Humphrys, who adopted shilly-shallying subterfuges. They were of such a character as to suggest that there was something in the background regarding the disaster which it was not desired should be brought to light. Eventually, when the plans and specifications were produced, it was found, for the first time, that the steel tank had not been tendered for upon equal terms—that each firm submitted its own plans and specifications. Two days after, the decision was arrived at to substitute a steel tank for the brick and puddle arrangement sanctioned by the Local Government Board, and certain contractors were asked to quote a price. A Gas Committee meeting was held at which

the tenders were submitted. He contended that there must have been somebody behind Mr. Humphrys who had got this matter all cut-and-dried, so that, to a certain extent, it was undoubtedly sprung upon the Committee. When asked who was the expert or individual who had caused him to change his mind, and substitute a steel tank for the brick and puddle one originally proposed, Mr. Humphrys' reply was that he had no recollection. Instead of accepting the £400 first offered by the Insurance Company in settlement of damages, the Corporation were paid £2000. If they had embarked upon litigation, he (Mr. Macdonald) did not think they would have got as much as the value of the desks which stood before them. Why would not Mr. Humphrys open his mouth about the matter? The onus lay upon him. The speaker complained also of the Corporation having permitted a gas company to place a ring round the town by getting a Provisional Order and so preventing Ilkeston from extending its mains outside the borough. He had noticed only a week before the last inquiry that Mr. Humphrys was a director of this company, and he had been told that he was consulting engineer as well.

Alderman Moss raised strong objection to Mr. Macdonald bringing in this personal matter and so attempting to prejudice Mr. Humphrys.

The MAYOR ruled that Mr. Macdonald was perfectly in order.

Mr. MACDONALD, after further reference to the Langley Mill Gas Company's Provisional Order, suggested that Mr. Humphrys should now be paid £450, and that they should shut the "soiled page" and let him depart in peace. He knew a suggestion had been made as to some ratepayers threatening to apply to the Court for an injunction to stop payment; but if anyone did this, he would be taking £450 out of Mr. Humphrys' pocket. He hoped some arrangement would be made whereby the £450 would be paid.

Mr. WOOLLEY, in reply to a question, said he thought it was understood that the meeting which Mr. Humphrys was to be asked to attend would be public; but, in order to make it quite clear, he would include this provision in his resolution.

The proposal that the meeting should be open to the public, and that Mr. Humphrys should be asked to attend, was then adopted.

Meanwhile, considerable curiosity continues to be manifested locally as to the outcome of the Corporation's application (regarding which no official information has been yet forthcoming) for leave to borrow a further large sum for purposes of gas-works extension.

NOTTINGHAM GAS-WORKERS' AGITATION.

A wordy controversy was waged last week at Nottingham regarding the circumstances attending the dispute which had entailed almost complete stoppage of operations in the gas-meter repairing shops of the Corporation. The tinsmiths who have been for several weeks on strike—or, as they prefer to describe it, "locked out"—were not content to allow the pronouncement of the Gas Committee, referred to in the last number of the "JOURNAL," to go unchallenged. At a meeting at which a possible extension of the trouble was threatened, it had been promised by Mr. J. C. Gordon, the General Secretary of the National Amalgamation of Sheet Metal Workers and Braziers, that a detailed reply should be forthcoming; and this was rendered in the course of the week—the official document traversing much of the ground covered by the Gas Committee, and joining issue with them upon some salient points involved. The reply also bears the *imprimatur* of the Nottingham Trades Council, as represented by its chief officials (Mr. G. Bell and Mr. G. Thundercliffe); the general effect of the declaration being to widen considerably the hitherto existing breach. The main feature of the dispute was again raised in the reference to the retention by the Committee in the workshop of the non-unionist Spencer, with whom, the rejoinder states, the men at the Woodborough Road depôt some four years ago objected to work, on the ground that he was always willing to accept the advances secured by the union, but refused to contribute to the organization by becoming a member; and, further, that he was always boasting that the advances he secured had not been obtained for him by the men, and that therefore he was in no way under any obligation to them. The subject was being continually brought up at the branch meetings, and it is represented that after an interview which Mr. Gordon had with Mr. Curtis, the Superintendent at the Woodborough Road works, the latter promised that, if the general body of men did not press for the non-union hand's removal, every effort would be made in order to prevent the latter from ever working with the others. The Committee regard the forcing of Spencer on one of the men as a violation of the understanding arrived at. The whole question is, therefore, again opened; and unless Spencer either joins the Society or is removed, the men will not resume work. The general assembly of delegates held on Sunday, the 1st inst., representing the various sections of unionists engaged in connection with the Gas Department, having indicated the possibilities of a formidable extension of the area of the trouble, the Gas Committee responded to the request which was made to receive a further deputation; a special meeting of the whole of the Committee being convened for Friday morning last.

In the interval, however, a further element, necessarily of a disturbing character, but rendered inevitable on the part of the police authorities by the demonstrations daily attending the dispute, had been imparted to the situation, as on Wednesday summonses were issued against six of the men formerly engaged at the Woodborough Road depôt for intimidation in relation to the foreman Mooney, who throughout appears to have been the special *bête noire* of the operatives' organization. The so-called "peaceful picketing" of the shops had, it is alleged, been carried to such an extent as to partake of the nature of unrestrained licence—both the foreman and Spencer having been daily followed to their homes, after leaving the workshops, by a howling mob.

Meanwhile, the heavy artillery of the local Trades Council has been brought to bear upon the Gas Committee; the responsibility for the attack which was made at the specially convened meeting on Friday morning last being entrusted to Mr. Bell and Mr. Thundercliffe, the President and Secretary respectively of the Union, who headed the organized workers forming the deputation, composed of the various sections of men connected with the Gas Department. The agitation, as a result of the plan of campaign decided upon at the gathering on the previous Sunday, had thus entered upon a broader basis. The main interest naturally revolved round the consideration whether the Committee could be prevailed upon to alter their view regarding non-union labour in the shop. Certain suggestions were made by the deputation, which met with favourable consideration; these being put forward upon the condition that their endorsement would be subsequently needed from the men who had not been consulted. Upon the principal point involved, however, the Committee asked time for further consideration—promising to communicate with the official heads of the deputation, from whom an expression of belief was forthcoming that, if the Committee would accept the proposal which had been made, it was believed the disaffected hands could be prevailed upon to return to work. The *modus vivendi* suggested by the men consisted in the proposed removal from the meter-repairing depôt to another department of Corporation work of the non-unionist whose presence remained the chief cause of the trouble. And upon this the whole question of ultimate authority in relation to the control of the shop necessarily depended.

The official reply, which was forthcoming on Saturday, effectually shattered any expectations trade unionists might have entertained that the Gas Committee would be found in a temporizing mood. Upon minor points, no difficulty has been experienced in arriving at an agreement. These related to the return to their original positions of three men who had been introduced into the shop from another section of the department, and to dispensing with the services of the foreman's son, who had been taken on temporarily with the intention of becoming an apprentice. But upon the principle involved as to the retention of the non-union hand, the Committee, while offering conditions indicative of willingness to deal with the situation in a reasonably complaisant mood, show that they will not submit to the trade union *ultimatum*. They are quite prepared, however, to ensure that the promise made by the Chairman some years ago to Mr. Gordon, that the particular man should, as far as possible, be kept apart from others in the shop, shall be loyally carried out.

So far as the temper of the men could be judged after the receipt of the Committee's reply, the decision is not likely to prove of a nature to lead to a speedy settlement of the trouble. Nothing short of removing from the shop the man who is alleged to have been the main cause of the upset will satisfy the members of the National Amalgamation; and the Gas Committee remain equally consistent in the resolve to see that he is not made the victim of trade union tyranny. The threat on the part of the unionists to extend the plan of campaign, by bringing out affiliated workers in other departments of the Committee's operations, did not cause dismay to Alderman Ball and his colleagues in the performance of an obviously difficult duty.

GAS PROFITS AT BRADFORD.

A Highly Satisfactory Statement.

The annual statement of accounts in connection with the gas undertaking of the Bradford Corporation was presented by the City Treasurer (Mr. F. Ogden Whiteley) at a meeting of the Gas Committee held last Friday. The net profit on the year's working was shown to be £19,745, compared with £9618 in the preceding twelve months—an increase of £10,127. The profit was higher than in any year since the purchase of the gas-works in the districts incorporated when the city boundaries were last extended. The income last year amounted to £337,541, which was an increase of no less than £22,921. The chief items contributing to this result were £5700 from additional sales of gas, and £15,200 from residuals. Better markets were found for coke, tar, and other products. Owing to the increased price of coal, the cost of the manufacture of gas exceeded by about £10,000 that for the preceding year; while a new item "Insurance Act Contributions"—added £450 to the expenditure. Though there was a capital outlay during the year of £12,000, sinking fund charges were decreased by £90. The sum of £823 was written-off for bad debts, or £84 less than for the preceding year. This was equal to 4s. 10d. per cent. of the income, against 5s. 9d. and 8s. 9d. in the two preceding years. After transferring upwards of £7000 from the revenue account towards the cost of the new vertical retorts at the Thornton Road works, there remained at the end of the year a credit balance of unappropriated profits amounting to £29,069. Of this sum £5000 is to be used for the relief of the rates during the current year. The statement was passed by the Committee, and the Gas Engineer (Mr. Charles Wood, F.C.S.) was congratulated upon the successful result of the year's working.

Working of the Limerick Gas Undertaking.—The Limerick Corporation adopted at a recent meeting a resolution which had been previously passed by the Standing Committee, reaffirming, on the basis of the report of the Irish Local Government Board Auditor on the Gas Committee's account for the year ended March, 1912, and certain letters in reference thereto, the Council's demand for a sworn inquiry by the Board into the working of the gas undertaking for the past ten years.

Unprofitable Electric Lighting in Dublin.—In the course of a discussion in the Dublin Municipal Council on certain proposed increases of salary for officials in the Electricity Department, it was stated that the rates had subsidized the concern to the extent of £45,000, and the opinion was expressed that the ratepayers should get back their money before other burdens were put upon them by increased salaries. One speaker said he found that the electric lighting receipts for 1912 were estimated at £87,632, and that the actual receipts were £3000 less than this, even though a charge was made to Corporation departments, and 10 per cent. was added as a special rate. He denied that any profit had been made, and moved that the matter before the Council should be adjourned until audited accounts had been submitted showing the actual position of the undertaking. The recommendations for increased salaries were adjourned for six months.

LEICESTER CORPORATION GAS DEPARTMENT.

Analysis of the Annual Accounts.

The Gas Engineer and Manager of the Leicester Corporation (Mr. Hubert Pooley, Assoc.M.Inst.C.E.) has issued his analysis of the accounts of the Gas Department for the past financial year. The sale of gas produced £249,900; and the coal and working expenses, less residuals, came to £136,355—showing a profit on gas of £113,545. Adding miscellaneous receipts amounting to £2164, the last-named sum was brought up to £115,708; being at the rate of 12s. 5·5d. per ton of coal carbonized and 1s. 0·91d. per 1000 cubic feet of gas sold. The net profit was £90,971, or 9s. 9·54d. per ton of coal carbonized and 10·15d. per 1000 cubic feet of gas sold. From the net profit had to be deducted £34,368 in aid of the district rate, £5400 placed to the reserve fund, and £6729 part payment for new meters; making together £46,497, and leaving a balance of £44,474—being 4s. 9·46d. per ton of coal carbonized and 4·96d. per 1000 cubic feet of gas sold. The capital outstanding at the close of the year was £1,047,319; being £5 12s. 9d. per ton of coal carbonized and 9s. 7d. per 1000 cubic feet of gas sold. The following are some of the particulars of working: Coal carbonized, 171,904 tons; oil used (coal equivalent), 13,841 tons (together, 185,745 tons); and gas made, 2,267,119,000 cubic feet, of which 2,150,991,282 cubic feet were sold—equal to 94·83 per cent. of the output. The make per ton was 12,205 cubic feet, and of this quantity 11,580 cubic feet were sold. The residuals were: Coke, 110,540 tons; tar, 1,973,618 gallons; sulphate of ammonia, 2159 tons—the makes per ton of coal only being respectively 13·09 cwt., 10·62 gallons, and 26·18 lbs. The returns from residuals were equal to 79·13 per cent. of the cost of coal.

BELFAST CORPORATION GAS UNDERTAKING.

A Record Year.

At the Meeting of the Belfast County Borough Council on Monday last week, the report of the Gas Committee, the principal figures in which have already been given in the "JOURNAL" [see *ante*, p. 678], was submitted.

Alderman CRAIG, the Chairman of the Committee, in moving the adoption of the report, said he was glad to be able to state that the profit for the past year amounted to £85,459—a figure which beat the previous best record by £15,968. This was obtained in spite of the fact that the cost of coal had increased by 2s. per ton, which was equal to £11,386; and, in addition, the discounts allowed to consumers had advanced by more than £20,000. The quantity of coal gas made amounted to 1389 million cubic feet, at a cost of £126,653; while 1091 million cubic feet of water gas were manufactured, at a cost of £50,400. The total make of gas for the year was 2480 million cubic feet—an increase of 142 millions on the previous year; the cost into the holders being £86,111. As compared with 1912, this showed a clear saving of £9500. There was an increase in revenue of £6739 from the sale of gas through ordinary meters, and through prepayment meters of £4254—a total of £10,993. The amount received from the sale of residual products was £90,942—an increase of £16,564. In the profit and loss account, after paying dividends, sinking fund, and the cost of the 28th issue of stock, the Committee had placed to the reserve fund £30,000; to the contingent renewal fund, £3000; and to the reserve for insurance of works, £1600. They had also contributed £10,000 to the general purposes fund in aid of rates, and £11,385 to pay dividends and sinking fund on the New City Hall Stock. During the year, the new vertical retorts, coke-handling plant, and gasholder had been brought into operation, and the results obtained had been highly satisfactory—in fact, a considerable amount of the increased profit earned was due to this plant. He was sorry to say, however, that the prospects for the coming year were not so bright as the Committee would like. They were paying an increased price for coal. This, combined with the higher cost of oil, would amount to £20,000; and, though their officials would do their best, the Council must expect the amount of profits to be considerably reduced next year. The Committee felt that their best thanks were due to the Manager (Mr. J. D. Smith) for the able way he had superintended the concern, and also to his staff for the manner in which they had performed their duties.

Mr. SQUIRE, in seconding the motion, remarked that the increase in the profits was to a large extent due to the sale of the residual products and to the alterations which had been made in the working of the undertaking by the management. The Council should, however, remember that they were entering upon a year which would very much change the aspect of their figures. There would be at least £20,000 extra to be provided; but possibly something more might be saved by increased economy in the working of the concern. He heartily endorsed what Alderman Craig had said about the Manager and his efficient staff.

Mr. JAMES JOHNSTON said he should like to offer a few observations in favour of the Gas Committee. From time to time they heard adverse criticisms of the several Corporation Committees, but he thought the satisfactory nature of the statement just submitted deserved cordial recognition from him as Chairman of the Finance Committee. The Corporation made no mistake when they secured Mr. Smith as Manager of the Gas-Works. The result of his management had been marvellous; and he (the speaker) thought they would all admit that his appointment had been justified. When they had an official doing such good work, they should publicly express their appreciation.

Alderman DORAN urged that some concession should be made to the penny-in-the-slot consumers.

Alderman FINNIGAN asked what was to be done with the £19,000 to be carried forward, after paying all the outgoings. A certain class of consumers were getting a handsome reduction in their accounts. But the users of the slot-meters had no reduction; and, as they were the main consumers of gas, the time must soon arrive for a substantial lowering of the price. He was opposed to the large grants made to other sources.

Alderman CRAIG, in replying to the discussion, pointed out that the profits from the gas consumed through prepayment meters were less than those from the ordinary meters. He said that the Committee had been thinking of reducing the price of gas if the cost of coal had not gone up; and they hoped to do so later on, when they saw how matters were developing in the coal trade.

The Committee's minutes, which embodied the report, were then adopted.

The Council subsequently accepted tenders for the supply of gas coal at prices ranging from 18s. 11d. down to 17s. 3d. per ton.

LINCOLN CORPORATION GAS AND WATER SUPPLY.

At the Monthly Meeting of the Lincoln City Council last Tuesday the reports of the Gas and Water Committees for the past financial year were presented.

The MAYOR (Alderman T. Wallis), referring to the progress of the gas undertaking, said the quantity of gas made was nearly 400 million cubic feet—10 millions more than in the year 1911-12. The cooking-stoves cost £1522; while the new stoves numbered 629. The Committee had allocated £5500 to the district rate, and had brought forward £1288. During the year, coal cost something like £2000 more than before; but residuals made up for a large amount. Taking it altogether, he thought the year had been a prosperous one. They had also put £600 to the reserve, which now amounted to about £9000; and by the end of the ensuing year they hoped to make it £10,000. But after this he trusted they would add no more to it, so that the money might be used for reducing the price of gas or relieving the rates. Dealing with the current year, the Mayor said it was a great disappointment to him and to his Committee that they had not been able to suggest a reduction in the price of gas. They had a long discussion upon it; but there was a majority against dealing with the matter at the present time. He had hoped it would be reduced by 1d. per 1000 cubic feet. At that time he thought coal would only go up 6d. per ton, instead of which it had increased 1s.—costing about £1500 more than before. Therefore, he considered the consumer might think himself very lucky that the Committee had not increased the price, instead of reducing it. Some might remark: "Why did you pay £5000 to the rates? There will be some left" But his experience of Lincoln and its prosperity was that the lower they could keep the rates and other things they had to deal with, the better it was for the city, as long as they dealt fairly with the consumer. Their price for gas was reasonable. He then moved the adoption of the Gas Committee's report.

Mr. MILNER seconded the motion, and heartily thanked the Gas Engineer and Manager (Mr. John Carter) and his staff for the efficient manner in which their work had been done.

The report was adopted.

Mr. T. C. HALKES then moved the adoption of the report of the Water Committee. In doing so, he said the accounts showed that up to March 31 the total income on revenue account was £30,954, including £801 balance at the beginning of the year; while the expenditure totalled £32,400—leaving a deficiency of £1446, which had been met by rate. Compared with 1911-12, the income showed a net increase of £1406, and the expenditure a net increase of £1661. In July, 1912, the revised scale of charges came into operation for the supply by meter; and the bulk of the increased income of £567 under this head might be attributed to the new scale. On the expenditure side, there was an increase of £849 for working, due to the largely increased charges for rates consequent upon the new works coming into assessment. On capital account, the figures showed that the balance overdrawn at the beginning of the year was £5651, and the payments amounted to £13,137; making a total of £18,788 to be provided. Almost the whole of the expenditure on the Elkesley scheme had been borrowed; a sum of about £2000 only remaining to be raised during the year to complete the payments. The total capital expended on the water-works undertaking to date was: Old works and plant, including town mains and services, £163,168; new works, Elkesley supply, £236,386; costs of Act of 1908, £7107—total, £406,661. The existing net liability in respect of this sum was £310,800; the difference of £95,861 representing loans repaid, sinking fund accumulations, and capital expenditure met by revenue account.

The report was adopted.

WEST BROMWICH GAS UNDERTAKING.

At the Meeting of the West Bromwich Town Council last Wednesday, the annual report and accounts of the gas undertaking, which have been briefly noticed in the "JOURNAL" (p. 687), were submitted.

Mr. J. BROCKHOUSE, the Chairman of the Gas Committee, said the profit was something like £1000 less than last year; but he reminded the Council that the bold step the Committee had taken in reducing the price of gas to ordinary consumers had cost about £1600. If they had not given this amount to the consumers, the profits would have been something like £600 in excess of those for 1911-12. He was convinced, however, that in reducing the price the Committee did the right thing; and he believed that it would popularize gas and make the undertaking more successful in the future. Then they had spent £1100 on mains and services, which was a considerable increase; and £600 of it had been paid out of revenue. The Committee had also increased the wages of their employees, which had affected them to the extent of £600. But he did not regret this, although it was another reason why the net profit had only reached £4824. Though the profit might seem small in proportion to the capital of the undertaking, he thought they had done remarkably well; and the Committee were perfectly satisfied that everything possible had

been done to improve the position of the concern. He admitted that the increase in the quantity of gas sold was not very great; but he felt sure the householders in the borough did not realize the uses to which gas could be put. He hoped that in the near future, by the adoption of pushing methods, they would augment their sales of gas. He commented upon the lack of enterprise in the borough, and said that if they had as much as some of their neighbours, their sales of gas would have gone up by 20 or 25 per cent. Though the price of gas to the prepayment meter consumers was so much more than that charged to the ordinary consumers, there was not all this profit in it; and he wished the Council could see their way clear for the next few years not to ask the Gas Committee for any contribution in relief of the rates, so that they could strengthen the undertaking, and put it upon a sound business basis.

The report was adopted.

ROTHERHAM CORPORATION GAS UNDERTAKING.

Annual Report of the Engineer and General Manager.

Mr. J. S. Naylor, the Engineer and General Manager of the Rotherham Corporation Gas Department, has presented to the Gas Committee his report for the year to March 31, accompanied by the accounts for that period. It furnishes the following particulars.

The quantity of coal carbonized during the year was 25,600 tons, at a cost of £14,635, or 11s. 5·21d. per ton, against 24,737 tons in the year 1911-12, costing £13,076, or 10s. 6·86d. per ton; being an increase of 863 tons and £1559 respectively. The gas made per ton of coal was 12,712 cubic feet, against 12,717 cubic feet before. The quantity of gas sold was 285,888,000 cubic feet, compared with 282,302,000 cubic feet; being an increase of 3,586,000 cubic feet, or 1·25 per cent. The unaccounted-for gas was 39,557,000 cubic feet, or 11·06 per cent. of the make, against 27,916,000 cubic feet, or 8·87 per cent.—an increase of 2·19 per cent. The works and plant were maintained in good repair and thorough working order out of the year's revenue. The prices of residuals were higher during the year, and realized £2768 more than in 1911-12. The gas for public lighting in the borough, including wages and maintenance of lamps, amounted to £4509, against £4553—a decrease of £44. The cost of gas for public lighting amounted to £2335, compared with £2376 before, or £41 less, due to the curtailing of street lighting during the coal strike. The balance due to the bank on the 31st of March was £590, against £2797 in the bank last year. A sum of £2643 has been allowed for depreciation, compared with £2849 last year. The amount of gross profit made was £16,289, against £16,109 for 1911-12—an increase of £180, notwithstanding that £1559 extra was paid for coal during the year, and that there was an increased assessment, which involved £1000 extra for rates. The net profit, after allowing for interest, redemption instalments, and contribution to the sinking fund, is £6694—an increase of £59 on the preceding year. If the gas for public lighting (£2335) is again given by the department, as in former years, there remains an available surplus profit of £4359, compared with £4259 before; being 3·66d., against 3·62d., per 1000 cubic feet of gas sold. The residuals made per ton of coal carbonized were: Coke and breeze, 12·41 cwt.; tar, 1·26 cwt.; ammoniacal liquor, 25·41 gallons. The average prices realized per ton were: Coke and breeze, 16s. 9½d.; tar, 35s. 11⅝d.; and ammoniacal liquor, 12s. 3¾d.

MIDDLETON CORPORATION GAS SUPPLY.

Reduction in Price—The New Engineer Complimented.

The minutes presented by the Gas Committee of the Middleton Corporation at the monthly meeting of the Town Council last Wednesday contained the announcement that they had decided that, as from the 1st of April last, the charge for gas for ordinary lighting, cooking, heating, power, and the public lamps should be reduced 2d. per 1000 cubic feet; and that the slot-meter consumer should be allowed an extra cubic foot per 1d.—this concession to take place as soon as the meters can be altered. In moving the adoption of the minutes, the Chairman of the Committee (Alderman Townend) said he wished to compliment the Gas Engineer (Mr. W. H. A. Chester) on his first year's working and his balance-sheet. The Committee felt that by the result they had been quite justified in the appointment they made. The profit was £2491; and part of it had to be put aside for the sinking fund. They had to face an advance in coal of £750. They would have been very glad to make a larger reduction in the price of gas. He wished to remind the Chairman of the Finance Committee that this reduction was equal to about 2¼d. in the pound. They were not going to be satisfied with this, but would try to get the price down further, which he could assure them would be done should things be anything like satisfactory. The life of a retort was not more than three years, and these would have to be renewed as well as the settings, at a cost of about £6000, during the next three years. When they compared the price of gas with other towns, and considered that there was no charge for meter or cooker hire, they could put these charges down at no less than 2d. per 1000 cubic feet. The number of cookers was 2756; and considering the numbers out, he was rather surprised that a greater quantity of gas was not used—thus creating a bigger day load. They had made during the year 144,239,000 cubic feet of gas; being an increase of 1,617,000 cubic feet on the previous year. The reduction in the price of gas by 2d. per 1000 cubic feet would mean a decreased revenue of £1100. The minutes were confirmed without discussion.

Referring to the above matter, the "Middleton Guardian" last Saturday said: "Alderman Townend had a very happy task in presenting the minutes of the Gas Committee, for he was able to announce a handsome profit in the department, and at the same time a reduction in the charge for gas of 2d. per 1000 cubic feet and a little freer meter to the penny-in-the-slot consumers. We join with the Alderman and the Council in congratulating the Manager on the successful year's working. The new Manager followed a man who knew his business, and left the concern in a businesslike position. We trust and believe that the present Manager will maintain this high standard of management, and hope eventually he will pull the concern out of the old rut into which a few years ago it seemed to have stuck. Councillor Wiggins had not so happy a story about the Electricity Department, for there a loss of £1800 is involved."

HINCKLEY DISTRICT COUNCIL GAS UNDERTAKING.

Annual Report of the Engineer and Manager.

The annual report of Mr. Fred Lee, the Engineer and Manager of the Hinckley Gas-Works, was presented at the meeting of the Urban District Council last Tuesday. It showed a gross profit for the year of £6419, compared with £6112 for 1911-12; the net profit being £3935 – an increase of £300. The year's contribution to the sinking fund was £1370; and, in addition, £229 had been paid out of profits—making a total of £1599. The loan liability is now at the low figure of 6s. per 1000 cubic feet of gas sold; while during the year the sum of £650 was transferred from profits for the relief of the district rate. The total revenue for gas was £12,793, compared with £12,478—an increase of £315. Receipts for coke and tar showed a considerable increase. The cost of coal was higher, and but for the favourable purchases in 1911 it would have been considerably more. There had been used 8900 tons to produce 100,843,000 cubic feet of gas, of which 97,950,900 cubic feet had been sold, 1,474,000 cubic feet used on the works, and 1,418,000 cubic feet, or 1·4 per cent., unaccounted for. During the year the price of gas for lighting had been reduced by 2d. per 1000 cubic feet. The price of gas for heating had been reduced to 2s per 1000 cubic feet; and for power and manufacturing purposes from 1s. 9d., 2s., and 2s. 3d. to 1s. 8d., 1s. 10d. and 2s. These reductions meant that consumers had paid £485 less than if the same prices had been charged as in the previous year. In addition, during the year the Council decided to clean incandescent burners free of cost for labour, and also to hire-out outside lamps for shops—59 now being let at low rentals. These concessions were appreciated by many of the consumers. The year had been the most successful in the history of the works; and the results were satisfactory, especially taking into account the general advance in the cost of materials, the reduction in the price of gas, and the effects of the coal strike.

In moving the adoption of the report, Mr. W. H. Bott, the Chairman of the Gas Committee, said the figures came out much better than had been expected. Out of the profits, the following sums had already been allocated: £896 on capital account, £919 on special renewals account, £228 as an extra payment to the sinking fund, and £650 to the general district rate. The Committee recommended that out of the balance £500 should be paid for land for the cemetery extension and £500 as an extra payment to the sinking fund; leaving £241 to be carried forward. For the current year they recommended that the price of gas should be reduced by 1d. per 1000 cubic feet. This would mean £400 a year, and with the 2d. taken off last year a decrease of £1200 in two years. The price of gas for lighting would then be 2s. 6d., and for power 1s. 7d., 1s. 9d., and 1s. 11d. These prices compared favourably with most towns in the country. They were only possible as the result of the policy of the Council in keeping the capital account low. During the past fifteen years, £19,653 had been paid off out of profits, in addition to the payments to the sinking fund. Beyond this, £6491 had been spent on special renewals, and £4307 had been transferred to the district rate during the past seven years. The Committee had passed a resolution congratulating Mr. Lee on the result of his year's work.

The report was unanimously adopted.

GLASTONBURY GAS UNDERTAKING.

A Satisfactory Report.

Some particulars as to the accounts of the Gas Department for the year ended March 31 were furnished by Alderman Morland at the monthly meeting of the Glastonbury Town Council last week.

They had, he said, now completed eleven years' working, and were operating on a very close margin. Last year, however, they made £90 profit, after meeting capital repayment and interest charges. In six of the eleven years they had made a profit; the total amount being £1042, as against losses of £550. This left a balance of profit of £492, which was now used as working capital. There had also been a considerable reduction in the price of gas, and in certain cases on the amounts payable for meters and stoves. If the charges had been at the old rate, there would have been an additional profit of over £300. They had paid off £2200 of capital, and had also added very largely to their stocks; so that the gas concern was better off, and worth very much more than at the beginning. The consumption had been increasing gradually.

Congratulatory remarks were made by several members; attention being drawn to the large decrease in the leakage. The Chairman (Mr. J. Merrick, J.P.) said they could not have a more able Manager than Mr. D. E. Garlick. The excellent manner in which he discharged his duties and looked out for various improvements deserved great praise. What had been accomplished was a splendid achievement.

Freedom from Naphthalene Troubles at Burnley.—In the course of the report on his work during the past twelve months, the Borough Analyst of Burnley (Mr. Raymond Ross, F.I.C., F.C.S.) states that naphthalene troubles were practically non-existent during the year, owing to the continued success of the method inaugurated about two years ago. Light naphtha is still used as a solvent, as, though several other substances have been examined with a view to their possible adoption, they were all found to be more or less unsuitable.

MARKET HARBOROUGH GAS SUPPLY.

Increased Consumption.

According to the report of the Gas Manager to the Market Harborough Urban District Council (Mr. A. T. Harris), the total make of gas in the year ended the 31st of March last was 62,510,000 cubic feet; being 4,010,000 cubic feet, or 6·41 per cent., more than in the preceding twelve months. There was an increase of 2,464,200 cubic feet in the quantity of gas sold through ordinary meters, and 986,200 cubic feet more through prepayment meters—a total of 3,450,400 cubic feet. A reduction made in the price of gas on the 1st of April last year represented a concession of £400 to the consumers; and yet there was an increase of £89 in the income from gas—it being £7334 against £7245. The net receipts were £10,881, and the expenditure was £7677; the gross profit being £3204, or £67 more than before. After providing for the interest on loans, &c., there was a net surplus of £1108. A sum of £779 had been expended on additions to the plant, and the balance at the credit of the profit and loss account was increased by the remainder (£329), and brought up to a total of £4598. Mr. Harris points out that the gross profit of £3204 is a record for the department, and he says it is primarily attributable to the increased output of gas, high prices realized for residuals, and the exceptional circumstances which counterbalanced the effect of the increased cost of coal, together with the working results having been well maintained. He regrets, however, to state that the outlook for the current year is not so favourable, as, while the cost of coal will be considerably increased, present prospects clearly indicate lower prices for residuals. The continuous increase in the output of gas (this having practically doubled since the Council took over the works) renders extensions to several portions of the plant necessary in the near future, if a satisfactory supply of gas is to be maintained.

The Chairman of the Gas Committee (Mr. A. Newcombe) also made a report on the progress of the undertaking, in the course of which he indicated the financial advantages which have accrued to the consumers as the result of its acquisition by the Council. He concluded by expressing his appreciation of the work of Mr. Harris, and saying that, after twelve years' observation, he was able to declare that the advantages to which he had referred were largely due to the Manager's business ability, intelligent foresight, and persevering application to the interests of the department.

The reports came before the Council at their meeting last Tuesday, and were adopted.

Wallasey Gas-Works Extensions.—The Wallasey Town Council last Thursday adopted a recommendation of the Gas and Water Committee that application should be made to the Local Government Board to sanction the borrowing of £40,200 for the extension of the gas-works.

MALTA AND MEDITERRANEAN GAS COMPANY.

A Satisfactory Report.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, Nos. 59-60, Gracechurch Street, E.C.—Colonel James Legeyt Daniell in the chair.

The Secretary (Mr. A. W. Cooper) read the notice convening the meeting and the certificate of the Auditors; and the report of the Directors and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said it was with much pleasure that the Directors again met the shareholders with a report which, under all the circumstances, might be considered very satisfactory. Referring to the whole of the stations, coal, oil, &c., cost £13,856, which was an increase compared with 1912 of £3016. This was a condition of affairs which all those connected with gas undertakings would have anticipated. As some compensation for this large additional expenditure, they found on the other side of the account an increase in the receipts from coke alone of £2288. If they placed this against the extra cost of coal, the result was that their coal cost them only £728 more than in the preceding year; and of this a considerable portion was due to the increased quantity of gas sold. The total output of gas was 134,277,000 cubic feet, and the make per ton of coal carbonized 11,375 feet. There were one or two items on the debtor side of the account which might probably have been noticed, and regarding which the proprietors might desire some explanation. In the first place, maintenance figured at £6345, against £5439, or an increase of £906. This was the result of the Directors having written-down the investments of the Company to the market price of the day. They wrote-off £1938, which was carried to the maintenance account. But for this, the item referred to would have come out more than £1000 less than it was the year before. Another item was law expenses. At the two stations of Trapani and Marsala, it would be remembered, there had been considerable difficulties and lengthy negotiations; and it had been necessary for the Board to rely upon their local solicitors there, and upon their Italian counsel. The latter was a man of considerable standing, and his fees alone amounted to £256. In addition, there was a sum of £327 for general law costs in connection with the two stations named. No doubt those present would like to hear something about the debt at Trapani, which he had alluded to at the meeting twelve months before. At that time, there were really two debts. There was what was called the old debt, for which they had obtained judgment; and there was the current debt. The two debts then stood at £11,228; but he was pleased to say that the authorities had kept up to their bargain, and had reduced this sum by £2460. While on this subject, he thought it was only fair to mention to the shareholders the name of Mr. Reid, who had been sent over from Malta to Marsala and Trapani. The very able manner in which he had settled this most

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is the latest undertaking to offer this apparatus to its consumers

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difficult affair deserved acknowledgment. At one time it looked as if there was no settlement at all to be arrived at; and therefore the Directors felt very much indebted to Mr. Reid for what he had done in the matter. Malta, which was the Company's principal station, must, of course, have the credit of any increase that had taken place in their business in the year under review. The make of gas there was 2,338,000 cubic feet more than in the preceding year. They could not expect much from the military establishments there, because it appeared that, as they could not make an arrangement with the Electric Lighting Company, they had supplied themselves with electrical installations in some of the barracks. The naval establishments were, of course, on a different footing. Though they also had installed their own electricity, they were open to sudden fluctuation—all depending upon the increase or decrease in the number of war vessels that were sent there. Let them, for many reasons besides gas, hope the strength in warships at Malta would be maintained. He thought he had now dealt with the principal points on which the shareholders would desire information. After all said and done, they found that the amortization account had been slightly increased by the interest on the investments of the Company; that £2000 had been added to the reserve fund, making it up to £5000; and that they carried forward a credit balance of £5963.

Colonel STEPHENSON R. CLARKE seconded the motion, and it was at once unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. M. PADDON, it was agreed that dividends at the rate of 7 per cent. on the first preference shares, 7½ per cent. on the second preference shares, and 6 per cent. on the ordinary shares, be declared for the year ending March 31—deducting the payments made on account.

The retiring Director (Mr. A. W. Oke) was then re-elected, on the motion of the CHAIRMAN, seconded by Mr. F. R. SMITH; and the Auditors (Mr. R. Hesketh Jones and Mr. Thomas Guyatt) were re-appointed, on the proposition of Mr. JOSEPH CASH, seconded by Mr. F. W. CHURCH.

The CHAIRMAN, in moving a vote of thanks to the Secretary, General Manager, and Engineers, and the staff generally, remarked that the shareholders and Directors were very much indebted to them for the manner in which they had performed their duties. It was most satisfactory, at this distance from the scene of active operations, to be able to rely with absolute confidence on those who served them; and the Board felt that they could not speak too highly of the management of the undertaking.

Mr. GUYATT, who seconded, said that, as an Auditor, he knew a great deal of the inner working of the Company, and was quite sure they could not have a better staff.

The proposition was cordially agreed to, and suitably acknowledged by Mr. COOPER.

A hearty vote of thanks was also passed to the Chairman and Directors, on the proposition of Mr. CHURCH, seconded by Mr. SMITH; and this brought the brief proceedings to an end.

SOUTH METROPOLITAN GAS COMPANY AND INSURANCE.

Position of Workmen under the New Act.

Those of our readers who have followed the progress of the South Metropolitan Gas Company will doubtless remember that for many years there was in existence a workmen's sick and burial fund—a private arrangement under which the members paid an agreed contribution, and the Company guaranteed the benefit. The scheme was at once simple and effective. Owing, however, to the passing of the National Insurance Act, an Approved Society had to be formed to take the place of the fund; and the effect of the change is described as follows by Mr. Henry Lesser in an article in the Company's "Co-Partnership Journal" for the current month.

From the quiet, unobtrusive methods of the old fund we have been caught in a perplexing tangle of Government "red tape." Ours, it seems, is not to reason why, but just to fulfil the mandates of the all-powerful Commissioners. Our rules relating to business under the Act are based on model rules prepared by the Commissioners. No material departure from these official rules has been sanctioned except under the greatest possible pressure on our part—and not always then. Next, the Commissioners lay down the law in the form of regulations setting out the rights and duties of the society, of its members, and of insured persons generally. These regulations are voluminous, technical, and frequently bewildering. So there has to be added a great quantity of official circulars and memoranda explaining how the regulations are to be understood and put into practice. This mass of literature is sent to us by instalments at short intervals—to be studied in haste, lest we may have to repent at leisure.

My readers will no doubt form some idea from the foregoing of the multiplicity of detail which the new conditions have created for us, and the consequent necessity for the methodical and systematic organization of our work. If we ask our members to comply with certain tiresome formalities from time to time, it is solely because we have to satisfy the Commissioners that we are claiming and disbursing the public money on proper authority and in a lawful manner. Every penny that we spend, in whatever shape or form, has to be justified and accounted for periodically to a Government Auditor. In fact, there is no transaction of the society which can escape his official scrutiny. The very minutes of our Committee meetings are carefully reviewed by him, in case we have unwittingly neglected or misconstrued our legal responsibilities.

But although the State assumes such extensive control, it does not guarantee the solvency of the society. Strange as this may seem, the anomaly is a fact. Our members will probably recollect that every three years (or shorter periods should the Commissioners think fit) a valuation has to be made of the society's funds. Should there be a

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Lifting Cornice (fixed if required) Wrought-Iron Bars which do not fall out when cornice is raised. Double reversible grill, which when reversed gives an absolutely vertical flame for boiling. All burners removable and interchangeable and fitted with gas and air adjusters. The cornice itself is roomy and of handsome appearance.

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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

deficit, the members themselves would have to provide the amount by means of a special levy made for the purpose. On the other hand, should we show a surplus of income over expenditure, the money would have to be distributed among the members in the shape of additional benefits. Thus, each society has to work out its own salvation; and it behoves us, therefore, to exercise the utmost care and economy in the administration of our affairs.

One of the greatest evils which societies have to combat is the particularly vicious practice of malingering—a device by which a man, on the pretence of incapacity, unfairly draws on the society's funds. It will be seen that under the national insurance scheme a malingerer not merely cheats the State, but also plunders the benefits of his fellow-members. Thanks, however, to co-partnership principles, we, for our part, have small reason for any anxiety on this account. Nevertheless, to "make assurance doubly sure," our Committee felt it their duty, when drafting the rules, to take some precaution against any possible imposition of the kind. Where the interests of all may be at the mercy of a few, the rules must be strictly adhered to; and unreasonable neglect to do so will, in certain cases, render the offender liable to a penalty.

Then we have to consider our relations with other Approved Societies. Members come to us and go from us, and their records follow them. Their position under the Act, however, remains unaltered by the change of society. Each society has to see that it furnishes the other with the accurate insurance history of the transferring member. If the particulars given in this way are incorrect, the member or the society may suffer harm in consequence. Therefore, to avoid the possibility of disputes in this connection, we have to ask our members to put in writing much that under the old fund was done by word of mouth—or, perhaps, was not required at all. At any rate, those concerned may be assured that no formality is required of them whenever it can be safely dispensed with. Up to the present, co-partners have responded most loyally to the calls that have been made upon them; and the possession of their confidence affords much encouragement to those in whom it is reposed.

The interests of our members are many-sided; but by acting through the Co-Partnership Committee a degree of concentration is secured of which the advantages cannot be too highly appreciated. In this respect, indeed, it may be said that if the National Insurance Act has absorbed our old fund, co-partnership has absorbed the National Insurance Act. The Commissioners, it is true, are our masters; but the prestige of our great Company is a heritage which commands for our new society the respect of all the public bodies with which we are brought into contact.

New Gas-Works for Cleckheaton.—The Cleckheaton Urban District Council have instructed the Clerk to apply to the Local Government Board for sanction to the borrowing of £35,780 to complete the scheme for new gas-works. A sum of £21,198 has already been obtained for this purpose.

NOTTINGHAM CORPORATION WATER SUPPLY.

The Past Year's Working.

The costly operations involved in connection with the Derwent Valley water scheme, which since the discovery of new sources nearer to the boundary of Nottingham, has come to be regarded as being somewhat in the nature of a white elephant so far as the city is concerned, would, it was at one time feared, entail the necessity for an annual call upon the rates to meet the financial obligations involved under the Act by which Sheffield, Leicester, and Derby are also bound. But anxiety upon this score has at length been allayed, thanks to discriminating measures which have been adopted by the Water Committee, the Chairman of which is Mr. A. R. Atkey, an ex-Sheriff of the city, and formerly connected with the clerical staff of the department. In the Committee's annual report, presented at the meeting of the Council on Monday last week, it was explained that the net profit was £3993, after paying £20,710 to the Derwent Board in respect of the supply from the Derbyshire source; the profit representing a slight increase upon the record of the previous year. The report contained the significant declaration that, in view of the circumstance that the profit had been realized after an exceptionally wet summer, involving a decrease of £3014 in the revenue from meter supplies, the Committee felt satisfied that they could carry the additional burden involved by the Derwent Valley scheme without any assistance from the general district rate.

The colliery workings under the Bestwood pumping station, near Nottingham, have caused grave anxiety; but there is now reason to hope that the anticipated subsidence will take place without any forced suspension of pumping operations. The total storage capacity of the various reservoirs is 13,845,058 gallons. Of this quantity only 11,829,808 gallons had been available during the past year. The total quantity of water distributed from all sources during the year amounted to 2,801,409,150 gallons. The average quantity distributed weekly was 53,873,252 gallons—equal to an average of 7,675,093 gallons per day. The total length of mains within the limits of supply is 429 miles.

Nottingham and the Derwent Valley Water Scheme.

Dealing with the position of Nottingham in connection with the Derwent Valley water scheme, as set forth in the opening paragraph, the Chairman of the Water Committee of the Corporation stated, at the meeting on Monday last week, that he wished the city could dispose altogether of its interest in the Derbyshire supply. They would be delighted, he declared, if any member could tell them of an authority who would like to take it over, or any portion of it. By economical administration much had been done to meet heavy capital expenditure by the Committee on new works in the immediate neighbourhood of Nottingham during the last four years—the outlay represented by additions to the pumping-station at Burton Joyce, the cost of the new main from Langley Mill, and other works, totalling £60,000. But

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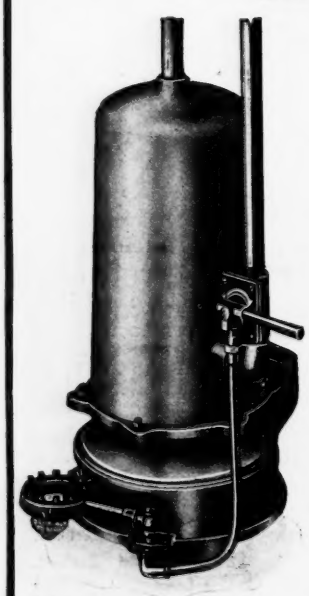

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White Enamelled Top.

Cross Stay or Support.

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Iron Tube you supply to suit height required.

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Mr. Atkey made it clear that all the revenue will now be required to meet the additional burden entailed by the Derwent scheme.

It is irritating enough, from the local point of view, that the Corporation should be unable to rid itself of its doubtful parliamentary bargain; but it is still more tantalizing that insult should be added to injury by reiterated complaints as to the quality of the article itself for which so heavy a price has to be paid. According to a letter published locally within the last few days, the Derwent water is offensive alike to sight, taste, and smell. The suggestion was emphatically repudiated by the Chairman of the Committee, who, while admitting that there might be a slight difference between this and the water supplied from the original wells, asserted that, when samples were taken separately, no one could tell one from the other. It apparently is so now; but the earlier experiences of the new supply seemed to warrant suspicions as to its quality.

NEW WATER-WORKS FOR YARMOUTH.

Mains under the Thurne—New Subsiding Reservoir.

An interesting piece of engineering work has lately been carried out at Potter Heigham Bridge, near Yarmouth, where a couple of steel tubes 100 feet long were sunk in the river bed as part of a development of the distributing plant of the Great Yarmouth Water Company. The alterations begin with the new intake at Horning, and include a subsiding reservoir at Ormesby, now in course of construction. The works at Potter Heigham, which were commenced on March 26, were of some magnitude, for the river had to be dammed, a trench more than 12 feet deep excavated in its bed for the reception of the tubes, and cofferdams made at either side.

The river was piled with logs of pitch pine, 27 feet long, driven in 20 feet, on which a series of twelve "gallows" frames were erected; and upon a platform above the water the tubes were placed in position, and bolted together till two lengths of 100 feet were in readiness. The tubes are of ½-inch steel, connected with flanges, riveted and bolted. Each flange is fixed with 18-inch bolts, joined with soft copper rings, and their total weight empty, with caps fitted at either end, was 15 tons. The pipes had been coated with layers of Hessian cloth, each well covered with bitumen to prevent corrosion. At the south side of the bridge they will be connected with the main to Yarmouth, and at the opposite end with the pipe from the new intake on the Bure at Horning. From either end a vertical pipe will rise, connecting the tubes with the mains below the road. From the frames the pipes were suspended by four chain blocks, each of which was manned by a couple of men, while others stood by to render aid.

The first process was to knock out the struts immediately below the two tubes, and replace them with others immediately above the pipes. Then the tubes were lowered easily enough, by inches, until they touched the river. As they were closed at the ends, the air within caused them to float. To sink them, it was necessary to load the space between the pair, and by means of bent steel bands 5 tons of old tramway rails and iron ballast were deposited, until one tube was below the surface. This was then filled with air to test the joints; and these having been found tight, its fellow tube was put through a similar test. After this their actual deposit was a mere matter of lowering them with the requisite tackle into the position in which they were to rest. When in the water they displaced 19 tons 1 qr. 22 lbs.

The work has been carried out by Airds Limited, under the direction of Messrs. T. & C. Hawksley, the Water Company's Consulting Engineers, and the supervision of the Manager (Mr. Joseph Hawksley). The Directors of the Company marked the occasion by inviting a few guests to luncheon, which was served prior to the actual lowering operations.

The new reservoir at Ormesby, to which reference has already been made, will contain the water brought by the new mains from the intake at Horning. The basin is 680 ft. by 525 ft., and it will have a capacity of 20 million gallons, which is equal to nine days' full supply. All the winter, about 150 men were busy excavating material, and raising an embankment all round to the height of 12 feet. The entire surface has to be coated with puddled clay, then with 6 inches of concrete, and after that with a coating of bitumen. The bottom will have 12 inches of clay, a 1½-inch casing of sand, and then be paved with bricks buried and grouted in cement. The upper parts of the walls will be finished off with blue Staffordshire bricks. Up to the present, the work has reached the clay lining stage on the slopes, where it is being rammed home by hand. The reservoir has a dividing wall across the centre to break the force of a wave that a high wind may create. It will also enable one-half of the reservoir to be kept full while the other half is emptied for cleansing purposes. It is estimated that the reservoir will not be in service till the end of next year or early in 1915.

Electric Lighting for Chipping Norton.—The Board of Trade have issued a special report on an application made by Mr. W. A. Schultz for a Provisional Order in respect of the borough of Chipping Norton. Mr. Schultz had already established an electricity supply without statutory powers; and the application was made to place the undertaking on a statutory basis. The Corporation withheld their consent to the application and lodged objections. Their only opposition was that the Draft Order enabled a minimum charge for 20 units per quarter to be made to consumers; whereas the Corporation required that the consumer should only be charged for each unit consumed irrespective of quantity. The Board informed the Corporation that it was their general practice to insert in Provisional Orders a provision to enable undertakers to charge for a minimum of 20 units per quarter, and that the requirement of the Corporation was not one which would justify the Board in refusing to grant the Order applied for. As the Corporation still refused to give their consent to the application, the Board decided to dispense with it, and to grant the Order.

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IT is characteristic of CARRON COOKERS to give long years of satisfying service, with little or no cost for maintenance.

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—A curious position has been reached in the discussion of terms between the plumbers and their masters. The matter was placed before Mr. Scott Dickson, M.P., who was to act as Arbiter to settle disputes; and he decided to increase the men's wages from 9d. to 9½d. per hour. The men objected to this finding, owing to an arbitration clause having been retained in the rules. They called for a deletion of this clause, and asked for an extra ½d. per hour from Sept. 1. This decision was communicated to the masters, who have replied that they intend to adhere strictly to the rules as amended. The Secretary of the Society pointed out that, Mr. Scott Dickson having given his decision, they must accept the clause equally with any other, and consequently the rules must stand for another year. It was ultimately decided to accept the Arbiter's decision.

Glasgow.—Though the accounts of the Gas Department for the financial year ending May 31 will not be ready for some time, it is probable that a revenue of over £1,000,000 will be recorded. This is some £76,000 more than for the previous year. The usual quantity of coals required in the year is about 700,000 tons; but it is probable rather more will be needed in the forthcoming year.

When will people learn that the wrong way to look for an escape of gas is with a naked light? While it is perhaps too much to expect the general public to learn the ordinary simple facts of science involved in the combustion of a mixture of gas and air, surely it is not too much to ask of the plumber, who is called in to detect escapes of gas by members of the public. One is brought to these reflections by a fire which occurred in a three-storey tenement in Grafton Square, Glasgow, where a plumber looked for an escape of gas in the manner described. As a result, an explosion took place, followed by a fire; damage being done to the extent of £200.

Buckhaven.—The minutes of the Gas Committee contained a note that a definite offer of a sum of money had been made to the Leven Gas Company for their property in the burgh. This, it was shown, was not the case, and the part mentioned was expunged.

Dunbar.—The position regarding the water scheme has been somewhat complicated by the receipt by the Council of a communication from the Local Government Board that, unless some satisfactory arrangement is made for increasing the water supply within one month, proceedings will be taken in the Court of Session under the Public Health Act. At a large meeting of ratepayers, presided over by Provost Low, a deputation, consisting of two members of the Town Council and seven ratepayers, was nominated to interview the Board on the matter.

Dunfermline.—The output of gas for the year ending May 15 was 156,961,000 cubic feet—an increase of 8,248,000 cubic feet, or 5·54 per cent., as compared with the preceding year.

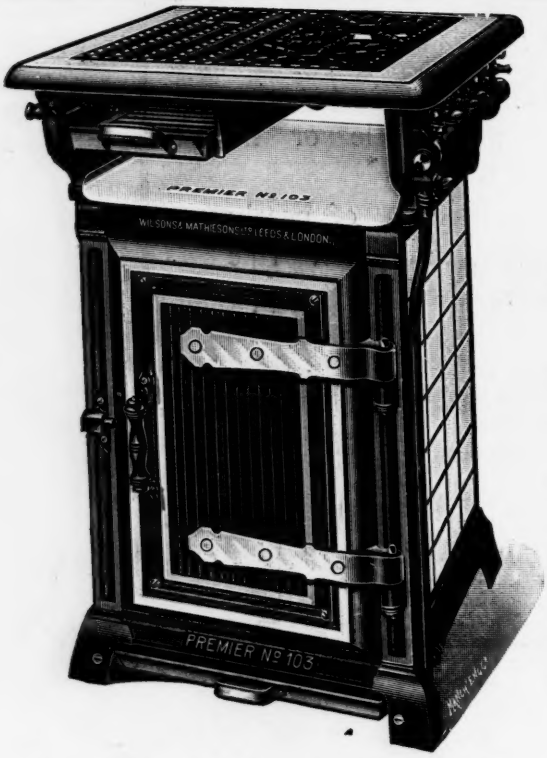
Duns.—The Town Council have been further discussing the price charged by the Gas Company for their gas. The Lighting Committee think that the Council should have better terms; and they asked that the supply to the Council should be given at the same rate (3s. 9d. per 1000 cubic feet) as the gas sold for heating purposes. The ordinary price for lighting gas is 5s. 5d. per 1000 cubic feet; and this is the figure which has been charged to the Council in the past.

Inverkeithing.—Reference was made on Friday, at the monthly meeting of the Town Council, to the steps being taken towards the acquisition of the gas-works by the Corporation. It was stated that the Special Committee appointed to deal with the matter had had under consideration statistics relating to the gas-works since the passing of the Burghs Gas Supply Act, 1876; and it was thought desirable that the Committee should visit similar-sized works that had been taken over by local authorities, to obtain full information.

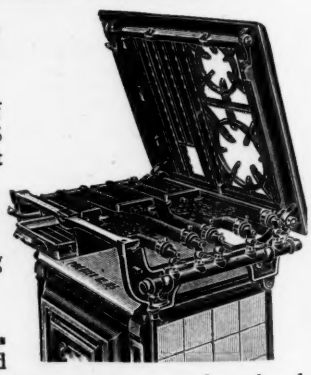
Kirkcaldy.—The Finance Committee of the Town Council have had a meeting at which it was reported that the gas undertaking would pay interest on the sinking fund, and that there would be a surplus, despite an increased expenditure for coal and wages, during the past year, of £2000; and this without any increased price of gas. This shows that the year's working has been perfectly satisfactory. The question of the cost of gas *versus* electric light has arisen in Kirkcaldy, where the two illuminants are both supplied under municipal control. Electric light is stated to be six times as costly as gas; but the Streets and Lighting Committee have decided to experiment with a new style of arc lamp, in order to economizing in the department. This is very necessary in view of the fact that a deficit is shown in the results of the year's working of the Electricity Department, which has also the benefit of a day load in the supply of power to the tramways. The question of using the powers under the Provisional Order to purchase certain property near the gas-works, or to allow these to lapse, will form the matter for discussion at an early meeting of the Town Council, and no doubt at the same time the plebiscite as to the extension and alteration of the works will again be discussed. The success of the undertaking will make it more difficult for the Committee to show the necessity of spending such a large sum upon new works when the old ones make so good a return for the price paid for them.

Leven.—The shadow of municipal control of part of their area has not adversely affected the position of the Gas Company. In the annual report, the Directors earmark £1800 for payment of dividend at 10 per cent., carry £500 to the reserve fund, and apply £1278 to the credit of the succeeding year. The coal bill has risen from £3163 to close upon £4000; wages, &c., are fully £150 more; and taxes show an increase of half this sum. The gas sold works out at £7690, or an increase of £600, tar realized £437, and coke £1237, as against £909. No less than £473 was drawn for sulphate of ammonia—more than double the receipts for the previous year.

PARAMOUNT FOR 1913 TRADE "PREMIER" COOKERS.



IMPORTANT "PREMIER POINTS."



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   Enamelled—mottled linings inside; white tile pattern outside. Spacious and perfectly ventilated. Improved fittings; Spring catch to door.
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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *June 7.*

The market has been quiet throughout the week, and there has again been a slight decline in values, those who have June contracts to cover being in no hurry, and direct demand being barely enough to sustain the opening prices. The closing quotations are £12 16s. 3d. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith. There has been good inquiry in the forward position, but the ideas of buyers are below the level of prices required by makers, and no further important first-hand business has transpired. It is reported, however, that important purchases have been made abroad at below the equivalents of makers' prices.

Nitrate of Soda.

The tone of this market is rather easier, and quotations have been reduced to 10s. 10½d. per cwt. for ordinary and 11s. for refined quality on spot.

LONDON, *June 9,*

Tar Products.

There is no material change in the markets for tar products, with the exception of pitch, which has again weakened, and there appears to be a fair quantity offering for prompt delivery. Offers have also been made abroad at reasonable prices for delivery up to the end of this year. Ninety per cent. benzol remains firm, and the inquiry is regular for near and forward delivery. Solvent naphtha is quiet, and business has been done at the reduced prices reported last week. There is little or no business doing in crude carbolic. Consumers will not contract for either the near or forward position unless prices are reduced. Creosote is fairly steady; but in certain quarters some very reasonable figures have been accepted.

The average values during the week were: Tar, 25s. 9d. to 29s. 9d. Pitch, London, 42s. to 43s.; east coast, 42s. to 42s. 6d.; west coast, Manchester, 41s. to 42s.; Liverpool, 42s. to 42s. 6d.; Clyde, 42s. to 43s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 11d. to 11½d.; North, 10½d. to 11d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 4¾d. to 5¼d. Solvent naphtha, naked, London, 11d. to 11½d.; North, 9½d. to 10d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3¼d.; North, 2⅞d. to 3d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 4d. to 1s. 4½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The position of this market remains about the same, and orders from abroad are scarce, though in some cases manufacturers report that they have been paid full prices for the forward position. On the other hand, buyers abroad report that they are being offered the article at the equivalent of to-day's quotations. Outside London makes are £12 7s. 6d.; Hull, £12 16s. 3d.; Liverpool, £12 17s. 6d.; Leith, £12 18s. 9d. to £13; and Middlesbrough, £12 16s. 3d. to £12 17s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a scarcity of steamships at the coal ports; and this has lessened shipments and had some influence on the prices of coal. In the steam coal trade, values are easier. Best Northumbrians are from 14s. 9d. to 15s. per ton f.o.b.; and second-class steams are about 13s. 9d. Steam smalls are lower at 8s. 6d. to 9s. per ton, with a moderate demand. The lower prices of fuel are now apparently bringing in more inquiries. In the gas coal trade, the quotations are better maintained than those for some other classes. Best Durhams are from 15s. 4½d. to 15s. 6d. per ton f.o.b.; and second-class gas coals are about 14s. 6d. For "Wear specials," from 15s. 6d. per ton f.o.b. is quoted. There have been one or two contracts for gas coal reported—one for 18,000 tons of second-class quality for Brussels, at a figure believed to be about 17s. per ton delivered; and another for 20,000 tons for the Padua Gas-Works. In the latter case, however, the prices are not yet stated. There is a good demand for gas coal for Genoa and one or two other Italian ports; but the higher sea freights make the cost of the fuel there heavy. Gas coke is steady in price, and the demand for export is stronger—a cargo of some 3000 tons for the Danube being under order for shipment from the Tyne.

Scotch Coal Trade.

Values are somewhat easier all round throughout the Scotch coal trade. On Friday, the following were the prices quoted on the Glasgow Coal Exchange: Steam coal, 13s. to 13s. 6d.; splint, 14s. 3d. to 14s. 9d.; ell, 13s. 3d. to 13s. 9d.; trebles and doubles, 12s. 9d. to 13s. 3d.; and singles, 12s. 6d. to 12s. 9d.—f.o.b. Glasgow.

Contamination of Reservoir Water.—The water in two of the three reservoirs at Chellow Dean, near Bradford, from which the town derives its supply, was last Wednesday found to be contaminated with a chemical substance similar to that used in the local dye-works. The supply from these reservoirs was accordingly at once cut off, and none of the water will be supplied for domestic purposes. Mr. F. W. Richardson, the Borough Analyst, states that, taking into consideration the immense volume of water, the dye would not have had an injurious effect on anyone who had drunk it. The poisonous nature of the preparation in the parts affected was, however, proved by the number of dead fish floating on the surface of the water.

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THE BEST SLOTS MADE.

No. 261. Dry "Slot" Meter. No. 265. Wet "Slot" Meter.

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New Issues of Gas and Water Capital.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards sold, under instructions from Directors, several new issues of gas and water capital. The first lots consisted of £10,000 of "D" capital water stock of the Barnet District Gas and Water Company, ranking for a maximum dividend of 7 per cent., and carrying £5 19s. per cent. from the 1st prox.; and they were placed at from £115 to £120 10s. per £100 of stock. A small issue of £10 "A" shares in the Tendring Hundred Water Company was offered at the reserved price of £10 10s. per share. These are 8 per cent. shares, on which 4½ per cent. has been paid for a number of years; and they are, to all intents and purposes, preference shares entitled to a further 3½ per cent. dividend when the profits permit of its payment. They were sold at the reserved price. Some £10 "C" shares in the East Grinstead Gas and Water Company (maximum dividend 7 per cent., present dividend £6 13s. per cent.) realized £11 to £11 5s. each. A few 6 per cent. non-cumulative £10 preference shares and some 5 per cent. perpetual debenture stock of the Hythe and Sandgate Gas Company were next offered; and they were sold at par.

Cockermouth Gas Undertaking.

Mr. Ernest D. Wootten, the Manager and Secretary of the Gas Department of the Cockermouth Urban District Council, has presented his report for the year ended the 31st of March last. It shows that the make of gas was 29,325,000 cubic feet, which constitutes a new record in the history of the undertaking. Mainly owing to the augmented sale of gas, and partly on account of the increase in price, the revenue from gas was larger than before. For the first six months of the year, the price charged to ordinary consumers was 2s. 6d. per 1000 cubic feet, and for the last six months 2s. 9d. The slot-meter consumers had the privilege of the lower price for the full twelve months; the quantity supplied being 29 cubic feet per 1d., against 27 cubic feet per 1d. at present. The gross profit for the year was £892—an increase of £34, notwithstanding additional expenditure. To be appropriated from the gross profit was £427 for interest on loans, and £531 for sinking fund payments; leaving a net deficit on the year of £66. The amount of working balance brought forward was £2807. Deducting from this the amount of deficit for the year, and also the new works expenditure (£319 being for retort-house extension), leaves the working balance at £2421. The quantity of coal carbonized was 2766 tons; the make of gas per ton being 10,598 cubic feet, compared with 10,205 cubic feet before.

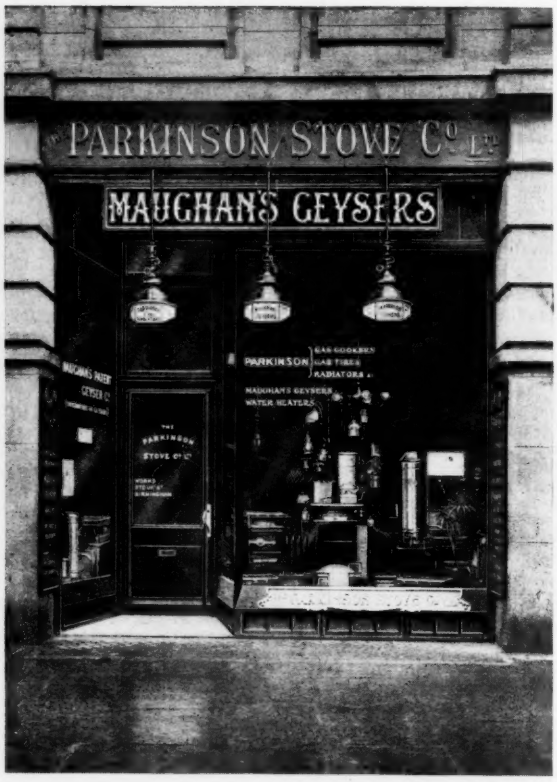
Birkenhead Corporation Gas Undertaking.

Referring, at the meeting of the Birkenhead Town Council last Wednesday, to the working of the gas undertaking during the past financial year, some figures in connection with which were given in the "JOURNAL" a few weeks ago [see *ante*, p. 348], Alderman J. H. M'Gaul, the Chairman of the Gas Committee, said the past year had been the best since the undertaking came under the control of the Corporation. In the previous year there was a sum left in abeyance, which was called the "reduction of price account," amounting to a considerable sum, and which with the profits of last year came to £64,126. After paying capital and other charges, a net balance of £39,949 was left. This was in excess of any profits they had had before. In addition, there had been paid out of income about £2500 for prepayment meters, stoves, and gas fires. The Committee had decided this year to add £10,000 to the renewals fund, which was more than double the amount ever placed to the fund, which now amounted to £22,000. They promised last year £12,000 for the reduction of the rates; but they now proposed to give £14,974, while a similar amount would be carried forward. In the reserve fund there was a sum equal to 6¾ per cent. of the capital outlay, which represented £32,927. There had been a large increase in the consumption of gas. For the coming year they had had to pay £4500 more for coal than in the previous twelve months, when £3200 more was paid than before.

Loughborough Gas Undertaking.

Among Leicestershire's most prosperous communities outside the county town itself, Loughborough occupies the leading place. Concurrently with its commercial development has come a substantial increase in the revenue of the chief municipal trading concern represented by the gas undertaking. Alderman Bumpus was in a position to announce at the last meeting of the Council that the profit of £9403 realized in the past year was by far the largest in the history of the works. There was now, he explained, a balance of £3681 on the profit and loss account. Of the available funds, £700 had been applied in reduction of the district rate; and the standing charges for interest, sinking fund, &c., were £6956—being an actual net profit of £2447. The credit balance on the profit and loss account would be reduced by £630, the amount which the gas undertaking owed to the general district fund in past years. This leaves, however, a very substantial sum standing to the credit of the undertaking, which is altogether in a very satisfactory position. Mr. W. Cartwright, the seconder of the motion for the adoption of the report, extended congratulations to the Committee and the Chairman upon the results achieved. A plea for a further consideration of the interests of the gas consumers was entered by a subsequent speaker, who suggested that the period had arrived when the price of gas should be reduced. As an outcome of the discussion, the Committee were requested to consider the matter and report.

The accounts of the Warrington Corporation for the financial year ending in March last have just been published, and the results show that the municipal undertakings have been most successful. The following are the net profits realized: Gas-works, £14,448; electricity undertaking, £2944; water-works, £2155; tramways, £3320. Out of the profits of the gas-works and tramways, a sum of £1500 has been devoted to the relief of the rates of the borough, which is equal to 1s. in the pound on the rateable value.



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Gas Affairs at Burnley.—At the meeting of the Burnley Town Council last Wednesday, it was briefly announced that the Gas Department had made a profit of £13,089 on the past year's working. This was a decrease of £251 on the estimates, and was due, it was explained, to the higher cost of coal and oil. Owing to oil being very dear, more coal than usual had been used. High-pressure lamps are now to be supplied to shops; and a special table of charges has been drawn up.

The Metropolitan Water Board's Deficiency.—At a conference of authorities constituting the Metropolitan Water Board held at the Camberwell Town Hall last Thursday, a resolution was passed regretting that at such an early stage in their existence the Board should find their maximum statutory income insufficient for the expenditure, and expressing the opinion that the principle of an indirect levy on the ratepayers to meet deficiencies by the method of precept upon other authorities was objectionable, and that a direct demand on consumers, thereby bringing to their notice the reason for the added demand, was preferable.

Dr. Leibbrand and the Felixstowe Electric Light Undertaking.—Correspondence has been going on lately between the Clerk to the Felixstowe and Walton Urban District Council and Dr. C. H. Leibbrand on the subject of a suggested purchase by the latter of the Council's electric light undertaking. The Council thought the intending purchaser should bear the expense of a preliminary investigation to ascertain the value of the concern; and they suggested that he should give them £200 to enable the Lighting Committee to deal with the matter. Dr. Leibbrand demurred to this; but, in order to test the sincerity of the Council, he proposed that, "subject to £100 of the £200 being refunded in case of no ultimate sale, or in case of sale the £200 being credited towards the purchase money," he said he was prepared to send the Council a cheque for the full amount. The Council have decided not to reopen negotiations with Dr. Leibbrand, or to have any further correspondence with him on the subject of the transfer of the undertaking.

APPLICATIONS FOR LETTERS PATENT.

12,184.—Rollason, A., "Carbonization of coal." May 26.
12,219.—Mann, J., "Burners." May 26.
12,224.—Storey, F. J., "Taps and cocks." May 26.
12,319.—Wilson, W. A., and Davies, H., "Burners." May 27.
12,320.—Palmer, C. H., "Acetylene generators." May 27.
12,338.—Duckham, A. M'D., "Heating vertical retorts." May 27.
12,353.—Oppermann, C., "Obtaining the volatile constituents or hydrocarbons from coal, &c." May 27.
12,448.—Herbst, R., "Acetylene generators." May 28.
12,450.—Bellamy, A. R., "Gas-engines." May 28.
12,587.—Maddick, S., "Method and means whereby equalization of light from an artificial illuminant is obtained." May 30.
12,613.—Forbes, S., "Gas cooker and fire lighter." May 30.
12,615.—Edmonds, H. C., "Gas-meters." May 30.
12,658.—Radet, L., "Automatic light-extinguisher." May 30.
12,676.—Hatfield, H. S., "Indicating and recording apparatus." May 31.
12,687.—Thompson, W. P., "Joint for high-pressure pipes or mains." A communication from the Soc. Anon. des Etablissements Poulenc frères and L. Pechiney. May 31.
12,696.—M'Court, C. D., and Bonecourt Surface Combustion, Limited, "Combustion of combustible mixtures." May 31.
12,698.—Schroers, W., "Gas-lighters." May 31.
12,699.—Behl, A., "Lighting gas-lamps from a distance." May 31

Tenders for the issue of one thousand £10 seven per cent. "B" shares in the Bournemouth Gas and Water Company (opened last Thursday) amounted to £15,165. The tenders ranged from £16 5s. to £15 per share. The average price obtained was £15 3s. 4d. per share.

GAS COMPANIES' STOCK AND SHARE LIST.

Bad as its predecessor was, last week on the Stock Exchange was worse; and the utmost that can be said for it is that things were not at their blackest at the close. Reference was briefly made in last week's issue to the main causes of the trouble—viz., over-speculation, inability to repay borrowed money on demand, &c.—and space will not allow of the elaboration of the theme. It is one that should give speculators cause to ponder; but probably the lesson will soon be forgotten—as lessons mostly are. It has been a very trying week; and the full measure of the mischief will be better known at the next settlement. The opening day was black, and gloom prevailed all day; while falls in price were considerable in some markets. The volume of sales was mainly to liquidate liabilities in new lines. Government issues were not much weaker; but Consols fell ¼. Other leading departments were decidedly lower. Tuesday was an anxious day. "Bears" who wanted to cover helped forced sellers a little; but the announcement of a rather important failure sent things down again, and markets in general closed lower. The tone on Wednesday was wretched. Money was tightening, and sales in every direction were pressed. Rails, which had to endure the superadded fear of strikes, shrank materially. Consols receded ¼. Thursday was a shade better. Instead of all markets being down, some were only irregular. But business was very quiet and disheartened. Consols lost another ⅛; but Rails and Americans closed above the worst of the day. Friday showed improvement, except for Consols, which again receded ⅛ in view of hardening money. Rails looked up, as buyers were tempted by low prices. On Saturday, things in general were fair, but business was too restricted to afford well-defined indications. Consols recovered ⅛, closing at 73⅜ to 73⅝—a fall of ½ in the week, after allowing for *ex div.* adjustment on the 3rd inst. In the Money Market, there was a strong demand; and discount quotations hardened so persistently as to cause some anxiety in regard to the Bank rate. Business in the Gas Market was again on a very reduced scale—much the same as it was the week before. As might be expected in so trying a period, when prices in all quarters were being knocked about ruthlessly, quotations were lower. But the fact that the falls were few and slight, affords good evidence of the strength of the market, and the unfailing favour with which the gas industry is regarded as a popular investment. In Gaslight and Coke issues, the ordinary was moderately dealt in at 101½ to 102¾—a fall of 1. In the secured issues, the maximum was done at 78, the preference at 94½ to 95, and the debenture at 74½. There were only three or four dealings in South Metropolitan at 109 to 109½—a fall of 1¼. Commercial 4 per cent. realized 106, the 3½ per cent. 102¾, and the debenture 71½. Among the Suburban and Provincial group, British made 45¼ and 45⅜, and Southampton 101½. On the local Exchanges, Liverpool "A" changed hands at 209 (a fall of 1½), and Newcastle at 98½. In the Continental companies, Imperial marked 162 to 165 (a fall of 3), Union 83 to 84, and European 17 15/16. Among the undertakings of the remoter world, Primitiva realized 5⅞ to 6¼ (a fall of ⅛), ditto preference 4⅞ to 5, and ditto debenture 94 *ex div.*

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	70–73	..	6 17 0
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	84–87	..	4 12 0
280,000	5	April 11	7½	Bombay, Ltd.	6¾–6⅞	..	5 11 1
50,000	10	Feb. 27	15	Bourne- mouth Gas & Water	10 p.c. 28½–29½ B 7 p.c. 15½–16½ Pref. 6 p.c. 13½–14½	..	5 1 8
332,000	10	,,	7			.	4 6 8
75,000	10	,,	6			..	4 4 3
380,000	Stk.	Feb. 27	14	Brentford Consolidated	260–265	..	5 5 8
380,000	,,	,,	11	Do. New	200–205	..	5 7 4
50,300	,,	,,	5	Do. 5 p.c. Pref.	113–115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	206–211	..	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	151–154	..	5 3 11
530,000	20	Mar. 28	12½	British	45–46	..	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	99–91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91¼–93½	..	4 5 7
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
150,000	10	—	—	Do. 4½ p.c. Pref.	4–5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78–83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	109½–111½	..	4 9 8
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	105–107	..	5 2 1
560,000	,,	,,	5¼	Do. 3½ p.c. do.	102–104	..	5 2 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	82–85	..	4 14 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	130–132	..	5 6 1
492,270	Stk.	—	5⅔	Derby Con. Stk.	124–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	17½–18½	..	5 8 1
16,415,840	Stk.	Feb. 13	4/17/4	Gas-light and Coke	4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb.	101–103	–1 4 14 8
2,600,000	,,	,,	3½			79–82	.. 4 5 4
4,062,235	,,	,,	4			94–97	.. 4 2 6
4,674,850	,,	Dec. 12	3			73–75	.. 4 0 0
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.		89–91	.. 5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.		—	.. —
70,000	10	April 25	11	Hongkong & China, Ltd.		17–17½	.. 6 5 9
131,000	Stk.	Mar. 13	7⅝	Ilford A and C		152–155	.. 4 18 4
65,780	,,	,,	6½	Do. B		120–122	.. 5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.		89–91	.. 4 7 11
4,940,000	Stk.	May 16	9	Imperial Continental		162–167	–3 5 7 9
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.		85–87	.. 4 0 6
300,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.		120–123	.. 4 17 7

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 27	10	Liverpool United A	208½–210½	–1½	4 15 0
718,100	,,	,,	7	Do. B	151–153	..	4 11 6
306,083	,,	Dec. 20	4	Do. Deb. Stk.	98–100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68–70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4⅜–5		6 0 0
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	98–100	..	4 10 0
541,920	20	May 30	4	Monte Video, Ltd.	12½–13*	..	6 3 1
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.	98–99	..	4 10 11
529,705	Stk.	Dec. 30	3⅜	Do. 3½ p.c. Deb.	85–86	..	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.	13–14	..	5 4 7
800,000	Stk.	May 16	8	Oriental, Ltd.	124–129		6 4 0
60,000	5	Mar. 28	10	Ottoman, Ltd.	8–8½	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B	125–128	..	5 1 7
100,000	50	,,	12	Do. C	122–125	..	4 16 0
249,980	5	May 16	8	Primitiva Ord.	6⅝–6¾	–⅛	6 8 0
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	4½–5 1/16	..	4 18 9
521,600	100	June 2	4	,, 4 p.c. Deb.	93–95*	..	4 4 3
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	92–94	..	4 5 1
275,000	5	Apl. 11	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	11½–11⅝	..	5 2 2
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Mar. 13	10	Sheffield A	225–227	..	4 8 1
209,984	,,	,,	10	Do. B	225–227	..	4 8 1
523,500	,,	,,	10	Do. C	225–227	..	4 8 1
90,000	10	May 30	7½	South African	9½–10½*	..	7 2 10
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	108½–110½	–⅛	4 18 11
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	73–75	..	4 0 0
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.	161–163	..	5 4 4
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.	117–119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	115–117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	117–119	..	4 4 0
594,740	Stk.	May 16	5	Southampton Ord.	100–103	..	4 17 1
120,000	Stk.	Feb. 13	7½	Tottenham and Edmonton A 5 p.c. B 3½ p.c. 4 p.c. Deb.	139–142	..	5 2 1
483,940	,,	,,	5¾		115–117	.	4 18 3
149,470	,,	Dec. 30	4		92–94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	96½–98½	..	5 1 6
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.	114–115	..	4 6 11
255,636	Stk.	Mar. 13	6⅞	Wands- worth B 3½ p.c. 3 p.c. Deb. Stk.	137–140	..	4 18 2
88,416	,,	Dec. 30	3		63 70	..	4 5 9

Prices marked * are "Ex-Div."

Darlington Gas-Works Extensions.—At the last monthly meeting of the Darlington Town Council, a question arose as to whether the extensions to the gas-works should be proceeded with, a new retort-house erected, and vertical retorts installed at a cost of £48,500. Mr. Pease explained that they had accepted contracts, and, though they had not been signed, the work had been prepared by the contractors, and the Council were morally bound to proceed with the work. Mr. Wooler contended that they would not be justified in going on until the Committee appointed to inquire into the question of gas *versus* electricity had reported. If they wanted additional manufacturing facilities, why not put down water-gas plant? He moved that the work be not proceeded with; but his proposal was rejected.

Prepayment Charges at Oldbury.—At the meeting of the Oldbury District Council last Friday, Mr. Wortley moved that the Gas Committee be asked to revise the scale of charges for gas supplied through prepayment meters, which now stands at 3s. 4d. per 1000 cubic feet. The Engineer and General Manager (Mr. A. Cooke) explained that there were 3000 slot-meters, and the capital cost of installing them was £17,000. When they considered that the Gas Committee installed these meters and fittings free, and kept them in order, the prepayment consumer was, he urged, much better off than the ordinary consumer who was paying 2s. 6d. per 1000 cubic feet for his gas. After some discussion, the Council expressed themselves as being quite satisfied with Mr. Cooke's explanation; and the resolution was rejected by an overwhelming majority.

Sequel to the Sydney Gas-Workers' Strike.—According to a Reuter telegram dispatched last Wednesday, between 200 and 300 summonses have been issued against the gas-workers who struck in February for an increase in wages of 1s. a day.

Price of Gas at Honley.—The minutes of the Gas Committee which were submitted at the monthly meeting of the Honley Urban District Council stated that it had been decided that the price of gas be reduced, and the following scale be adopted from the period of reading meters at March, 1913: Lighting accounts, quarterly, up to £20, 2s. 11d. per 1000 cubic feet, less 2½ per cent. if paid within one month; accounts over £20, 5 per cent. discount; slot-meters, 20 cubic feet per 1d. with 2d. in the shilling discount. Gas used through separate meters for other than lighting purposes, accounts up to 50,000 cubic feet per quarter, 2s. 3d. per 1000 feet net; over 50,000 and under 100,000 feet, 2s.; over 100,000 and under 200,000 feet, 1s. 11d.; and over 200,000 feet, 1s. 10d. It was decided that the rent of gas-cookers be reduced from April 1. The salary of the Gas Manager (Mr. Harry Marsden) was increased to £230 per annum.

The Carron Company have sent us a copy of their new season's booklet, in which will be found illustrated particulars of a great variety of gas cookers, grillers, boiling burners, and other appliances. The booklet has an artistic coloured wrapper.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS AND WATER ENGINEER. Mansfield Corporation. Applications by June 24.
MANAGER (Australia). No. 5745.
DRAUGHTSMAN. Newton, Chambers, and Co., Thorncliffe Iron Works.
WORKING FOREMAN. Sidmouth Gas-Works.
BENCH FOREMAN. No. 5746.
MECHANIC. Cleethorpes Gas Company.
SLOT COLLECTOR AND OFFICE ASSISTANT. Stamford Gas Company. Applications by June 16.
WATER FITTING INSPECTOR. East Grinstead Gas and Water Works.

Appointments, &c., Wanted.

CHEMICAL PLUMBER. Davies, Galloway Road, Shepherd's Bush, W.
REPRESENTATIVE (Meters, Tubes, and Fire-Clay). No. 5748.

Plant, &c. (Second Hand), Wanted.

SULPHATE OF AMMONIA STILL. No. 5747.

Plant, &c. (Second Hand), for Sale.

WASHER & EXHAUSTERS. South Suburban Gas-Works.

Sales of Stocks and Shares.

ANNFIELD PLAIN GAS CO. London Mart. June 17.
BOMBAY GAS COMPANY. London Mart. June 17.
BRENTFORD GAS COMPANY. London Mart. June 24.
BRIGHTON GAS COMPANY. London Mart. June 24.
BRITISH GASLIGHT COMPANY. London Mart. June 24.
CAPE TOWN GAS COMPANY. London Mart. June 17.
EUROPEAN GAS COMPANY. London Mart. June 24.
GRAYS AND TILBURY GAS CO. London Mart. June 17.
ILFORD GAS COMPANY. London Mart. June 24.
LOWESTOFT WATER AND GAS CO. London Mart. June 17.
NORTH MIDDLESEX GAS CO. London Mart, June 24.
ORIENTAL GAS COMPANY. London Mart. JULE 17.
PRIMITIVA GAS COMPANY. London Mart. June 17.
SOUTH AFRICAN LIGHTING ASSOCIATION. London Mart. June 24.
SOUTH BARRACAS GAS CO. London Mart June 17.
SOUTH SUBURBAN GAS CO. London Mart. June 24.
TOTTENHAM GAS COMPANY. London Mart. June 24.

Meeting.

INSTITUTION OF GAS ENGINEERS. June 17 to 19.

TENDERS FOR

Coal.

DARLINGTON GAS DEPARTMENT. Tenders by June 19.
EAST RETFORD GAS DEPARTMENT. Tenders by July 5.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by June 24.
HUYTON AND ROBY GAS COMPANY. Tenders by June 14.
LIMERICK GAS COMMITTEE. Tenders by June 30.
NEWBURY GAS DEPARTMENT. Tenders by June 16.
NEW MILLS URBAN DISTRICT COUNCIL. Tenders by June 17.

Sulphuric Acid.

EAST HULL GAS COMPANY. Tenders by June 25.

Tar.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by June 18.
GUILDFORD GASLIGHT COMPANY. Tenders by June 20.

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